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POPULAR MECHANICS MAGAZINE

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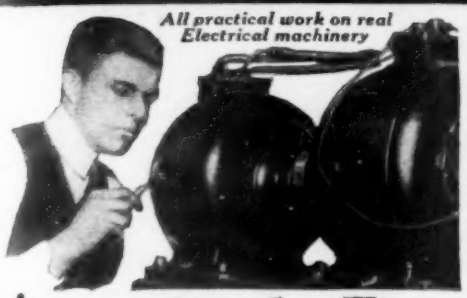
Get Into One Of These BIG PAY FIELDS



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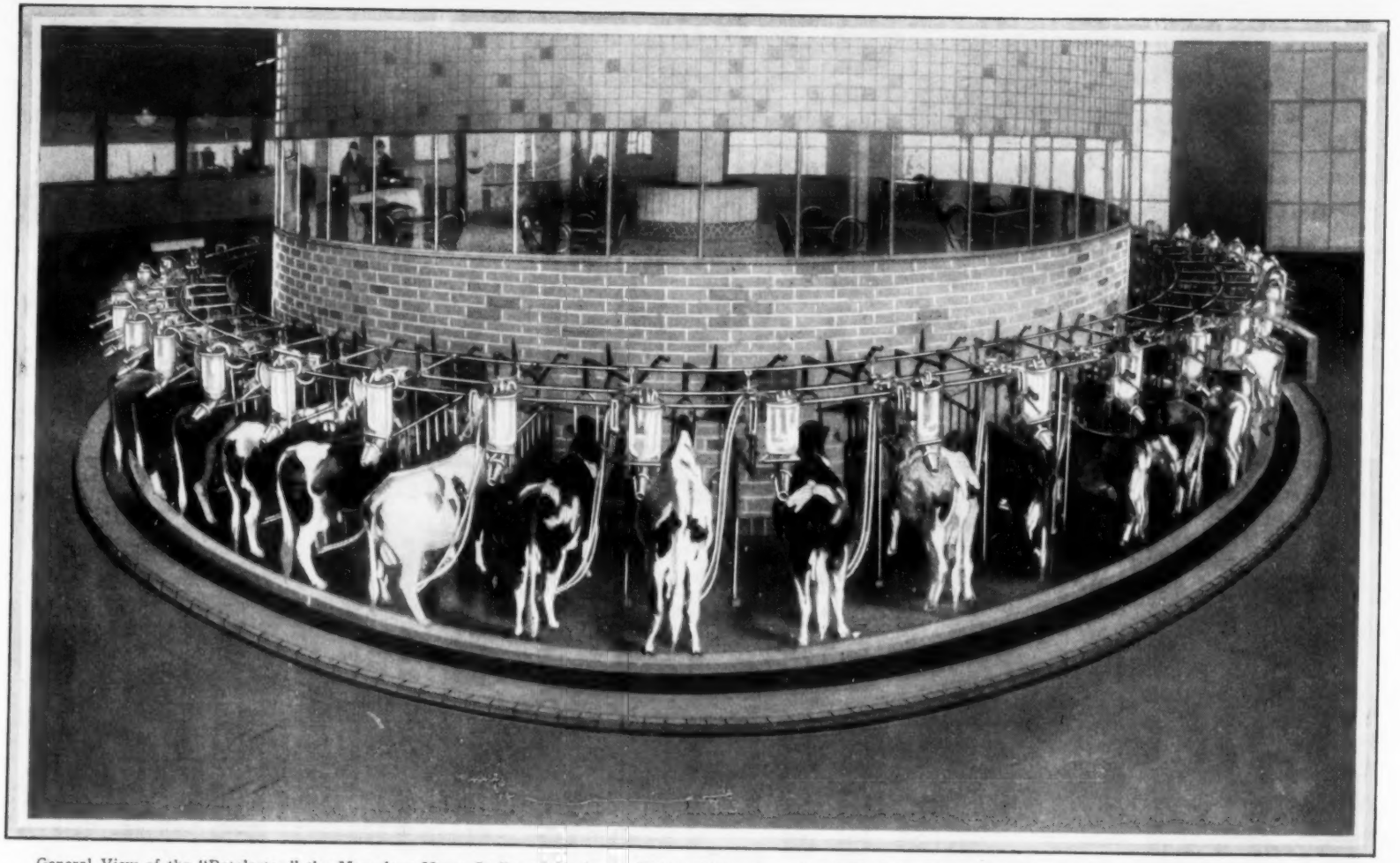

General View of the "Rotolactor," the Marvelous Merry-Go-Round Device on Which Fifty Cows Are Milked by Electricity; the Platform Revolves Slowly, the Cows Stepping On and Off One at a Time; the Cows Are Given Warm and Cold Showers, Dried with Electric Driers and Wiped with Individual Towels

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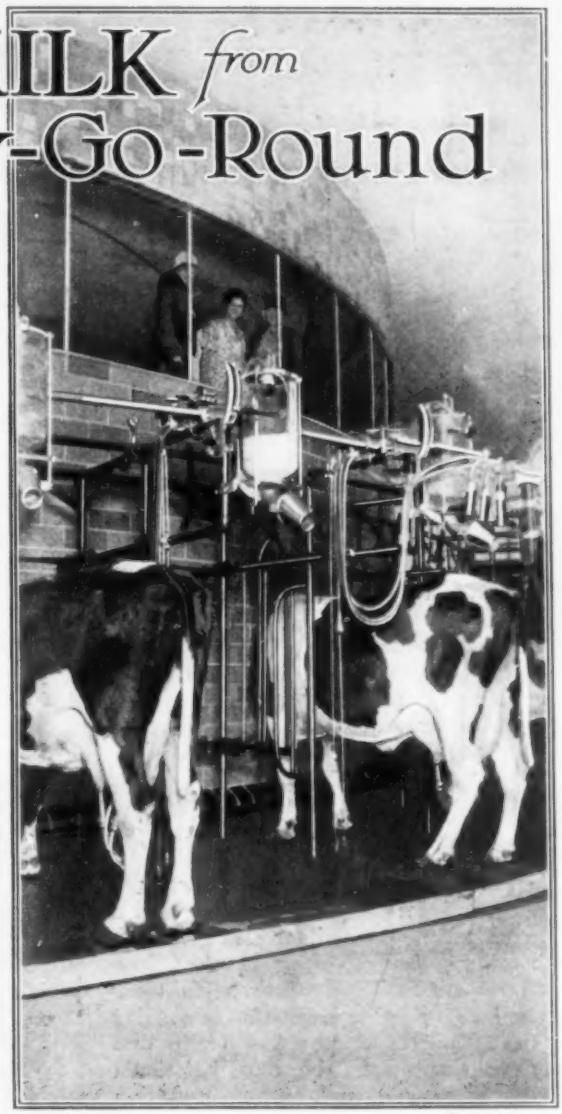
SUPER MILK *from* Merry-Go-Round

By PAUL D. PADDOCK

FIFTY cows are bathed, dried and milked in twelve and one-half minutes in an air-conditioned palace on the Walker-Gordon farms at Plainsboro, N. J., where dairying methods are being revolutionized with the production of a super-milk, an improved system of farming and a milking device that puts a once prosaic task into the realm of a mechanical fine art.

The milker, privately tested for months, was introduced to the public just recently. Astounded visitors, comfortably seated in a glass-lined rotunda above the cows, saw a merry-go-round contrivance that promises to put the dairy barn of the future into the heart of the city. Cows, kept in healthful, sanitary surroundings with the aid of artificial sunlight and man-made climate, and eating foods extra-rich in the necessary ingredients, will be milked three times a day, and the product, germfree and far more nutritious than ordinary milk, will be quickly distributed without once touching human hands.



The Milk, Extracted by Milkers, Goes into Glass Cylinders above the Cows and Is Automatically Weighed and Recorded

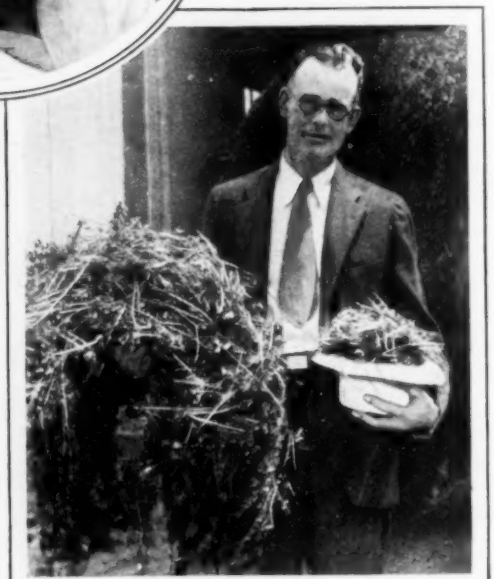
The milking merry-go-round, developed by Henry W. Jeffers after years of experiment and research, takes the hard work out of milking, saves time and makes it possible for a few men to handle hundreds of cows a day. More than 1,500 are milked three times a day on the Walker-Gordon farms. Incidentally, the machine is so adjusted that it stimulates the production of more and better milk. Here is how it works.

Cows walk from their barns some distance away, enter a tiled passage single-file and step, one by one, upon a slowly revolving platform, a "Rotolactor" as it is called. During the first few feet of the ride, the cow receives a warm and a cold shower and as she passes air driers, an attendant dries the udder and sides with a clean white towel. Each cow has her own towel.

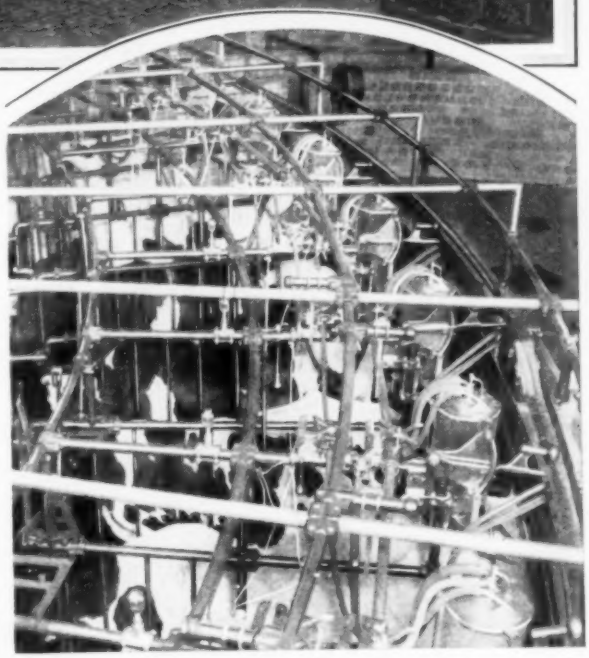
Another attendant then draws a sample of milk for infection test by hand, and a DeLaval magnetic milker is attached. With every pulsation of the machine, the milk goes streaming up into a glass jar attached to uprights over the cow. By the time the Rotolactor has made one complete revolution, the cow has been thoroughly milked, and, as her stanchion is released, she steps off the platform and walks back to her barn. The cows are easily taught this routine and appear to enjoy the system. They do not leave their barns except to go to and from the milking platform.

The milk is released from the jar, automatically weighed and recorded and then is drawn through sanitary pipes into the bottling rooms where it is made ready for distribution. A special aluminum cap for the bottles has been devised to promote further cleanliness. In case the sample of milk taken for a test, reveals any infection or disease, the cow will be tagged and her milk kept separate. The cow would immediately be given a thorough medical examination and, if conditions warranted, would be sent to a special hospital farm.

The rotating platform is so nicely balanced that a small electric motor furnishes sufficient power to turn it, and the magnetic milkers are adjusted to give from forty-five to forty-eight pulsations per minute, a rate con-



Giving the Cows Their Showers, Bacteria Counter, and Sample of Dehydrated Alfalfa in Hat



Room above the Milking Platform Where Visitors Gather Is Handsomely Decorated in Tiles; Below, Looking Down on the Cows and Machines

ducive to the best milking. The regularity of milking time, the even speed of the machine, the comfortable and quiet surroundings, and other factors, all encourage a maximum milk yield. Even the tiled walls are of a color that will add to the harmony of the entire installation, thus contributing a psychological aid to attendants and possibly to the cows as well, for it has been proved that the cow actually manufactures most of her milk during the operation of milking, and every factor that promotes her comfort and ease does its bit to stimulate a more abundant flow of milk.

This marvelous milking unit is only one of the interesting developments on the farm where the leading authorities of the country have been working for years under the direction of the Borden research foundation toward the production of a better milk. Regarding it as somewhat of a factory proposition, for the cow is essentially a miraculous living factory, the investigators started the "production line" with the soil.

They argued that a richer soil, improved with better fertilizers, would in turn produce crops having greater quantities of healthful substances. The crops, in turn, would be specially treated. By an improved method of dehydration, for instance, the farms are furnishing the cows with alfalfa that contains several times the amount of vitamin A usually present in ordinary alfalfa hay. Other crops are dried and treated to increase their vitamin content.

Two Curved, Snakelike Horns Used by Ancient Vikings; Note the Flaring Ends, Resembling Radio Loud Speakers

HORN LIKE A LOUD SPEAKER SUMMONED VIKING TO WAR

Two curved and elongated horns used by the ancient Vikings of the eighth century have been sent recently to this country from Denmark. These snakelike instruments, nearly ten feet in length, were used to summon the Viking hosts to council and to war, or to signalize events of rare importance. They curl to a round, enlarged end to which is attached a sounding disk, somewhat resembling the modern radio loud speaker.

AIR TRANSPORT GROWS SAFER FLYING RECORDS SHOW

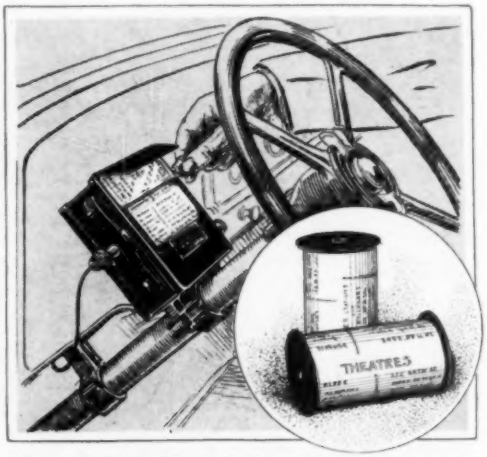
In line with the constantly increasing safety of military flying, there has been a corresponding improvement in the safety of scheduled air transportation, government records show. Comparing the first six months of 1930 with a like period for 1929, the reports state that last year, transport planes flew 384,152 miles to each accident, whereas in 1929, they flew but 150,842 miles to each accident.

SUN'S TRAVEL IN DUST CLOUDS CAUSE OF ICE AGES

Solar-eclipse studies may reveal the cause of the earth's glacial periods. This is the opinion of Dr. Harlan T. Stetson, director of Perkins observatory, Ohio Wesleyan University, who has advanced a theory that dust clouds in space are responsible for the ice ages. He believes that the sun at times may travel through such clouds of cosmic dust, shadowing the sun's rays sufficiently to reduce the earth's temperature to glacial levels. By measuring the varying brightness of the sun's corona in eclipse after eclipse, he believes the cause of variations in light and heat reaching the earth can be determined.

MAP ON STEERING POST LATEST CITY GUIDE

Easily attached to the automobile wheel post, a reel map gives locations of important places in the city. Over 2,000 are listed, and the reel is turned by a crank. The guide is lighted at night with current from the battery system, and the printed reels are easily taken out for the substitution of new ones, either blanks or special guides made by the car owner.



Drawing of the Street Guide Attached to the Automobile Steering Post, and View of the Rolls

MODEL LINERS BUILT TO CARRY FOUR PASSENGERS

Launching One of the Large-Scale Models Built at German School; Some of the Vessels Are Electrically Powered and Lighted, and Will Carry Several Passengers

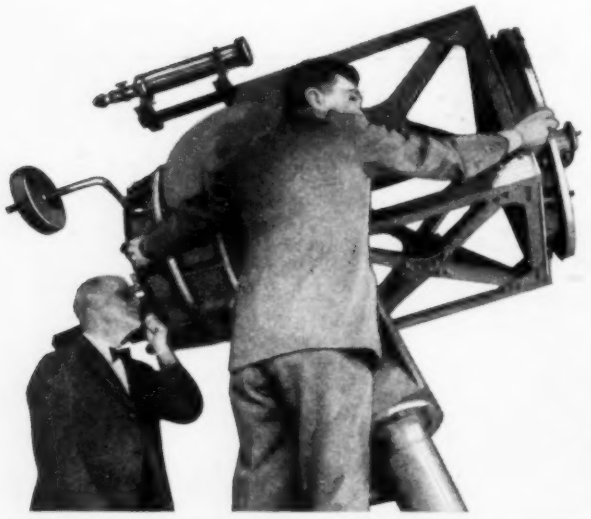
At an interesting model-building school in Potsdam, Germany, young men are being taught how to construct large-scale models of real ocean liners and other craft. The replicas are powered by sail or motors and are large enough to carry one or more passengers. A model of the Lloyd steamer "Columbus," electrically powered and lighted, had sufficient room for four passengers. An electric stove and radio were additional features. Models of the "Hamburg," and the "Hindenburg," and various other boats have been made. The school aims to give its students practical and theoretical knowledge that will enable them to continue this line of work to become marine architects or engineers.

MIRAGE IS SEEN AT NIGHT BY LIGHTNING FLASH

Members of an exploring party on the edge of the Sahara desert were astonished recently during a thunderstorm at night, to see a range of snow-clad mountains outlined against the sky as the lightning flashed. The nearest range in that direction was the Atlas mountains, 500 miles away, so the observers concluded that the lightning had produced a mirage, making the peaks plainly visible in this way. The phenomenon was repeated on another evening under almost identical conditions.

PISTON SLAP QUICKLY STOPPED BY AIR EXPANDER

Eliminating slap without removing pistons from the block is accomplished with a pneumatic piston expander. It consists of a hammer operating on an air pressure of seventy-five pounds or more, and works by peening the skirt of the piston to fit the cylinder wall at the point where slap develops. A long handle with thumb control and a magnetic trouble lamp enable the task to be performed in comfort. The expander thus saves considerable time.



Testing Twenty-Inch Telescope That Has Tube But Fifty-Four Inches Long; It Reduces Distortion and Takes Sharp Photos

CLEARER VIEW OF STARS GIVEN BY SHORT TELESCOPE

Designed especially for star photography, a twenty-inch telescope for use at Miami, Fla., has mirrors so arranged that they reduce distortion and pictures of unusual sharpness can be taken. The photographs can be studied over their entire area with a microscope, so clear are the details. The usual refracting telescope with an aperture as large as the one in the new unit would require a tube more than thirty feet long but the special telescope's tube is but fifty-four inches in length.

MIRROR FOR AUTO-PIT LIGHT AIDS IN CAR REPAIRS

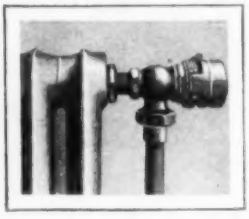
Automobile pits in an eastern service station are brilliantly illuminated on the inside by means of wall lamps and mirrors inclined at an angle to reflect the rays to the best advantage. The sides of the pit are also painted white as an additional aid to the workers.

ENGINEERS TAKE LESSON FROM SHIP WORM IN BORING TUNNEL

Ship worms, which cause much damage to piers and ship timbers, taught the makers of London's first underground railways how to bore and line their tunnels to resist water. The worm makes a boring about half an inch in diameter, lining it with a limelike substance to keep out the water in the damp wood in which it lives. When engineers made the first attempts at underground passages, they had difficulty in keeping the water out of the London clay. By studying the technique of the ship worm, they learned that they could keep the bore dry by lining it as they progressed. In boring its passage, the worm bites away the wood which passes in small particles through its body and the same idea is in use today in the engineer's shield, a metal casing the size of the tunnel which moves forward at the same time as the electric drills which move the earth away.

AUTOMATIC CONTROL OF HEAT FOR EVERY RADIATOR

Individual control of the steam supply to each radiator in a two-pipe system is made possible with a thermostatic device which brings independent and automatic temperature control for each room. The device, known as a "radiatherm," does automatically what an expert operator would accomplish if he continually watched a thermometer and opened and closed a hand-control valve to regulate room temperature. The automatic control effects fuel saving because it maintains a predetermined constant temperature, regardless of changes in steam pressure or outside temperature, as long as an adequate heating system is in operation. The device is as easily installed as an ordinary radiator valve.



A Million Dollar Windowless Plant

Architect's Drawing of Proposed Windowless Factory, Illuminated and Ventilated for the Most Efficient Working Conditions

WHAT is aimed to be the most efficient, and, unquestionably, will be the most amazing manufacturing plant in the world—is to be erected at Fitchburg, Mass., by the Simonds Saw and Steel company.

This million-dollar factory will have no windows or skylights, yet it will be lighted throughout with an efficiency four times greater than that of any other structure of its kind. There will be no dark corners and every last inch of the building will be lighted to the same adequate degree.

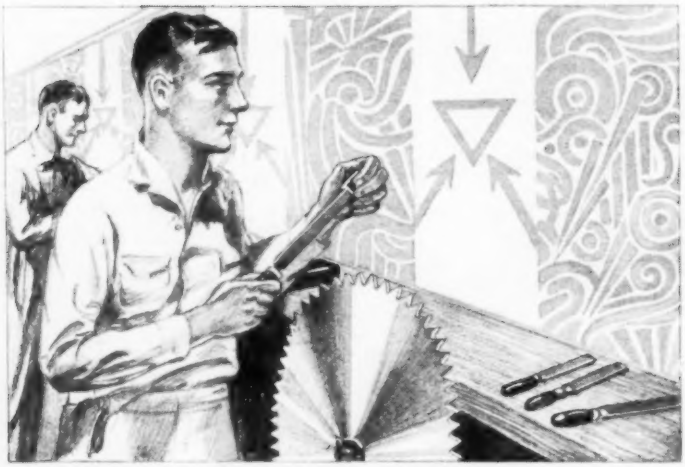
Not a single breeze will find its way into the plant, yet the inside air will be purer than the outside. Furnaces will roar at tremendous temperatures, but the workers will feel no uncomfortable heat. Oils, some of them mighty smelly, will boil as glowing metal is plunged into them, yet not a single odor will pollute the atmosphere. Grinding wheels whirling against hard steel will produce clouds of dust, but very few specks of it will float through the air. The plant will be warm in the winter and cool in the summer.

The new plant will be a one-story structure, with ground dimensions of 570 by 360 feet and height of twenty-five feet. Every process from metal treating to shipping will be carried out on one floor. Electric power will be used. The building will be completed about March 1 and the plant will be running by June 1, this year.

"How did you happen to plan a windowless plant," Popular Mechanics Magazine asked G. K. Simonds, general manager of the corporation.

"We didn't," Mr. Simonds explained. "It was forced upon us. We simply started out, two years ago, to plan a plant in which conditions would be as nearly perfect as possible. Of late years, you know, most of the efforts of manufacturers have been directed toward the perfecting of their machinery and tools.

"We have not slighted this important item one jot, but have extended the search



Artist's Conception of Wall Designs That May Be Used as "Rest Points" to Soothe the Eyes after Close Application to Tasks

for high efficiency to the human element. We figure that perfect workmen are even more important than perfect machines and work routing. No one can have perfect workers without perfect working conditions. That's what we are striving for.

"Side windows were ruled out very early in our planning. No factory can be lighted efficiently from the side walls. Next, we considered skylights with a north exposure. These offer some improvement, but still leave dark spots, and the light is not constant. An additional factor that made us rule out natural light was the realization that glass cannot possibly be soundproofed. Turning one-third of the wall space into glass windows increases the commercial noise more than two-thirds.

"The lighting system will be direct. The ceiling will be studded with a myriad of 1,000-watt ultraviolet-ray lamps. Adequate, uniform lighting increases speed and quality of manufacture. Furthermore, adequate lighting is the greatest of safety devices. In addition, the entire building will be insulated as efficiently as the best refrigerator. It will be kept at a constant temperature by an automatically controlled system. The inside air will be changed every ten minutes.

"The making of our products necessitates a great amount of noise. That harsh, loud noises contribute greatly to a lowering of human efficiency, is no longer debatable. Workmen may believe that they become so used to noises that they are not affected by them, but our experiments show that the less noise we have, the greater and better the output.

"There is no harsher or more penetrating sound, nor one that rasps the nerves more than the dry-grinding of hard steel and the filing of saws. High-pitched sounds such as these are the hardest to reduce, but we have proved the possibility of lessening them more than sixty per cent. Low-pitched sounds, such as the thud of a triphammer, will be reduced nearly eighty-five per cent, which comes close to eliminating them.

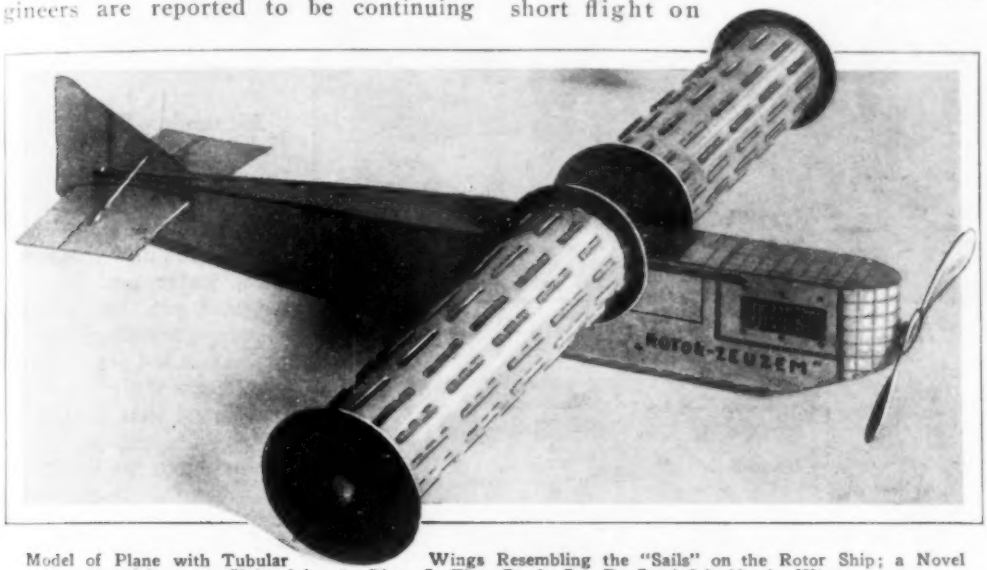
"From the color standpoint, the interior will present an aspect the like of which you have never seen in a manufacturing plant. The work of the color experts, oculists, and others is not as yet complete, but is far enough along so that I can state that blue and yellow will predominate. The walls near certain processes will probably be striped in red. These colors have been decided upon as best for production. All the nonworking parts of the machinery will be enameled yellow.

"No worker, glancing up from his job, will have to look at a blank wall. You know that, when your eyes are tired from reading or other close work, looking up and changing the focus for a few moments rests them greatly. Our expert mechanics do a great deal of fine work. Looking up at a blank wall makes a change of focus difficult and decreases the rest gained in a given time. So, when one of our workers glances up, his gaze will encounter one of a myriad of adjustment spots painted on the walls. These may be pictures, circles, diamonds or other designs; the best designs have not been determined finally as yet.

"When the plant is placed in operation the efficiency of our workers will be increased at least one-third. This means benefits to everyone concerned."

ROTOR WINGS ON PLANE TO BE TESTED IN EUROPE

Although first experiments with a so-called "rotor wing" plane ended in failure in this country, German aeronautical engineers are reported to be continuing their tests with the design. The accompanying illustration shows a model plane of the type, the invention of Ernst Zeuzem, a well known German engineer. It incorporates some of the principles of the rotor ship which had slowly rotating columns instead of sails. The shape of the rotor wing is calculated to give ample lift, although one of the chief problems yet to be solved is reliable control. An experimental rotor ship was tested in this country not long ago and made a short flight on Long Island sound. At a height of about eighteen feet, it went out of control and plunged into the water without injury to its two occupants. The rotor-plane wings have a smaller span than those of a plane of like size, thus simplifying the storage question and engineers believe that, with proper design, it will be able to lift more than the usual ship.



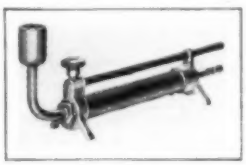
Model of Plane with Tubular Wings Resembling the "Sails" on the Rotor Ship; a Novel Advantage Claimed for the Plane Is That Goods Can Be Carried inside the Wings

SODA FIZZ AS PNEUMONIA CURE IS SUCCESS IN TESTS

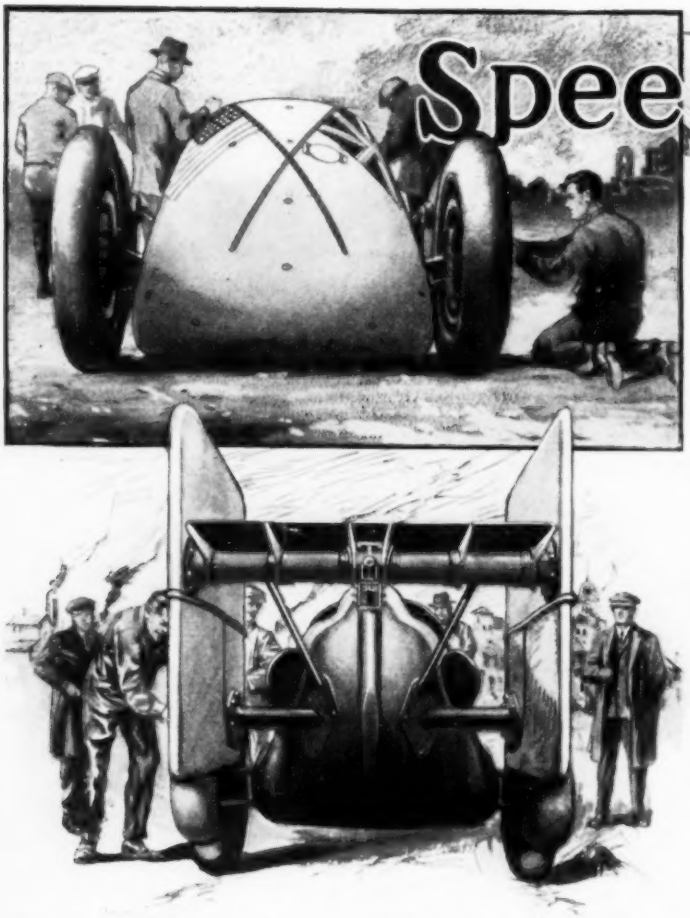
Soda fizz, a combination of oxygen and carbon dioxide, administered through a common inhalator, has been used successfully in fighting pneumonia. Matthew S. Sloan, of the New York Edison company, said the treatment has been turned over to the medical profession after being used on 127 company employes. Of eighty-five patients treated in the preliminary stages, seventy recovered. The experiments were based on research carried out by Dr. Yandell Henderson, of Yale University, and while the method is not considered a general cure, it is believed to be a valuable aid in fighting the disease. The mixture, among other things, has been found to aid in relieving heart strain.

BLOWTORCH FOR NATURAL GAS DOES NOT GO OUT

Using natural or artificial gas for fuel, a blowtorch and Bunsen burner that will not blow out when the flame is properly adjusted, is now being used by the dental profession and in other trades. The natural-gas flame is hot enough to melt and fuse metals, and also can be used for lead burning, soldering and preheating.



Speeding



Front and Rear Views of Kaye Don's "Silver Bullet," Designed to Beat the Late Major Segrave's Record of Over 231 Miles an Hour

By ANTHONY WAYNE

JUST one hundred years ago, the first covered wagon left St. Louis for the far west and started the Oregon trail.

In 1860, the riders of the Pony Express were carrying news from St. Joseph, Mo., to the coast in thirteen days.

Today the west-to-east trip from the Pacific to the Atlantic has been made by airplane in twelve hours, twenty-five minutes and three seconds and by automobile in sixty-seven hours and thirty-eight minutes.

At a cost of millions of dollars, Schneider trophy planes have attained nearly 380 miles an hour, and Kaye Don's "Silver Bullet" is being groomed to better the late Maj. Segrave's record at Daytona Beach, Fla., of 231.36 miles an hour.

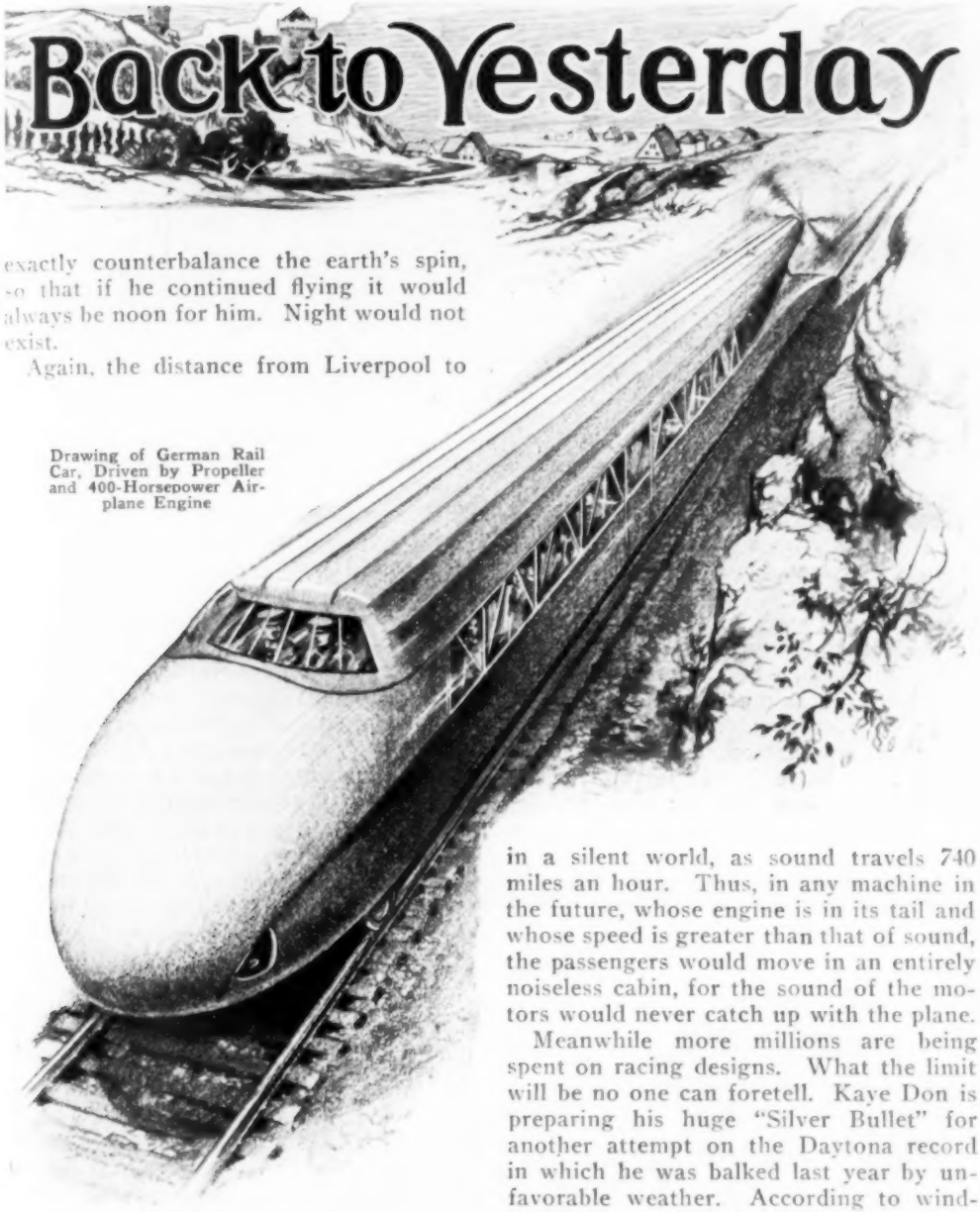
Alexander Winton's speed of one mile in fifty-three and one-half seconds, made in 1909, is a snail's pace compared to the records now made on land, water and in the air, and yet the present speeds, according to engineers and designers, are merely samples of the real speed that is still to come.

Nor have we long to wait for it. Prof. Herman Oberth, a responsible scientist with an international reputation, has experimented with a space rocket which will have a maximum speed of one mile per second. Ultimately it is hoped to construct a rocket which may be propelled across the Atlantic at a speed of 3,600 miles an hour.

What such speed means can be seen when you consider that the earth revolves once upon its axis every day. At the equator, the earth's circumference is roughly 24,000 miles, so that there the earth, by turning once in twenty-four hours, moves at a speed of about 1,000 miles an hour. In Great Britain, being nearer the pole, there is less distance to turn and the same time to do it, so the speed is less. In fact, Britain is rotating in space at about 600 miles an hour.

As we already have machines capable of nearly 400 miles an hour, it is to be expected that it will not be long until an airplane is built capable of a speed equal to the world's turn in our own latitude. The effect of this would be that, if a pilot in such a machine flew west, he would

Back to Yesterday



Drawing of German Rail Car, Driven by Propeller and 400-Horsepower Airplane Engine

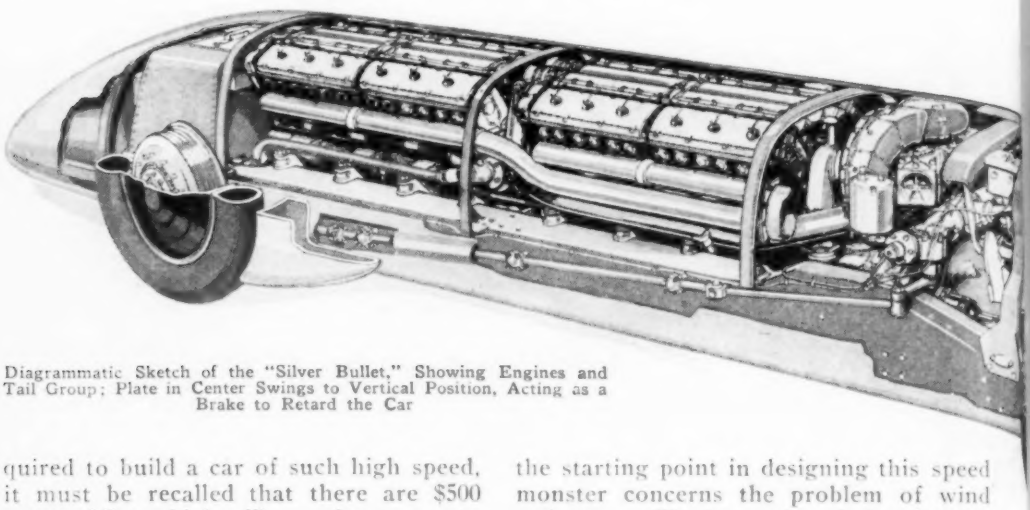
exactly counterbalance the earth's spin, so that if he continued flying it would always be noon for him. Night would not exist.

Again, the distance from Liverpool to New York is roughly 3,000 miles, so that a space rocket, moving at 3,600 miles per hour, would make the journey in slightly more than forty-five minutes. Which means that if the rocket left London at six in the evening, it would arrive in New York at about 1:45 p.m., or some four hours before it started.

Then all high-speed travelers would live in a silent world, as sound travels 740 miles an hour. Thus, in any machine in the future, whose engine is in its tail and whose speed is greater than that of sound, the passengers would move in an entirely noiseless cabin, for the sound of the motors would never catch up with the plane.

Meanwhile more millions are being spent on racing designs. What the limit will be no one can foretell. Kaye Don is preparing his huge "Silver Bullet" for another attempt on the Daytona record in which he was balked last year by unfavorable weather. According to wind-tunnel tests, there is no doubt that the car as it stands is capable of 300 or possibly 350 miles per hour. To drive the car 300 miles per hour only 1,050 horsepower is required. With a larger supercharger to permit the engines to develop their full 4,000 horsepower, the maximum speed is variously estimated as 400 to 475 miles per hour.

In order to appreciate the expense re-



Diagrammatic Sketch of the "Silver Bullet," Showing Engines and Tail Group; Plate in Center Swings to Vertical Position, Acting as a Brake to Retard the Car

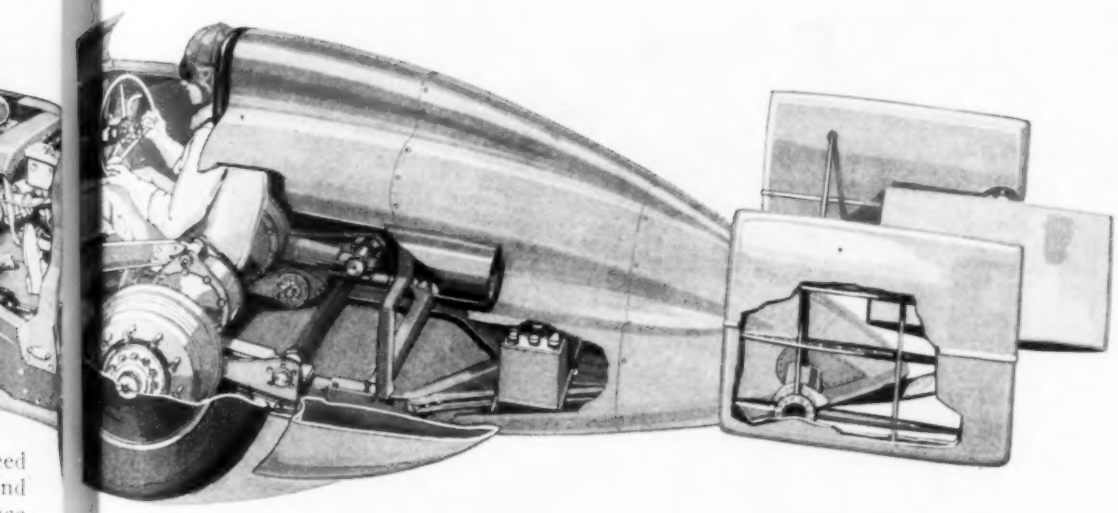
quired to build a car of such high speed, it must be recalled that there are $500 automobiles which will run about seventy miles per hour, whereas the "Silver Bullet" cost 500 times this figure, or a quarter of a million dollars, for five to seven times the speed. The cheaper American cars cost less than twenty-five cents per pound, whereas Kaye Don's car, with a weight of 10,000 pounds, cost $25 per pound—one hundred times as much.

The unprecedented cost of the "Silver Bullet" is due almost entirely to wind resistance. Were it not for the power required to force the car through the air, $20,000 would amply cover the cost of a 400-mile-per-hour car. Therefore the starting point in designing this speed monster concerns the problem of wind resistance. The lower the wind resistance of the car, the lower its cost for a given speed. Hence, although the car cost a huge sum, the money expended for an ultimate speed of, say, 400 miles would have been still greater had the wind resistance been higher.

Now, the one unalterable fact concerning the building of a one-man racing automobile is the width of the driver including room for his elbows while steering the car. This governs the width of the body. His elbows of course must be inside the car, not only because their wind resistance, if allowed to stick out, would seriously affect the maximum speed, but also because the rush of the wind at 400 miles might tear his arms from the steering wheel. Two years ago at Daytona Beach, the late Ray Keech while driving the "Triplex" at about 200 miles per hour hit a bump which threw his head into the wind stream at one side, and he had a brief but serious struggle to pull it back in—and Keech was an exceptionally strong man.

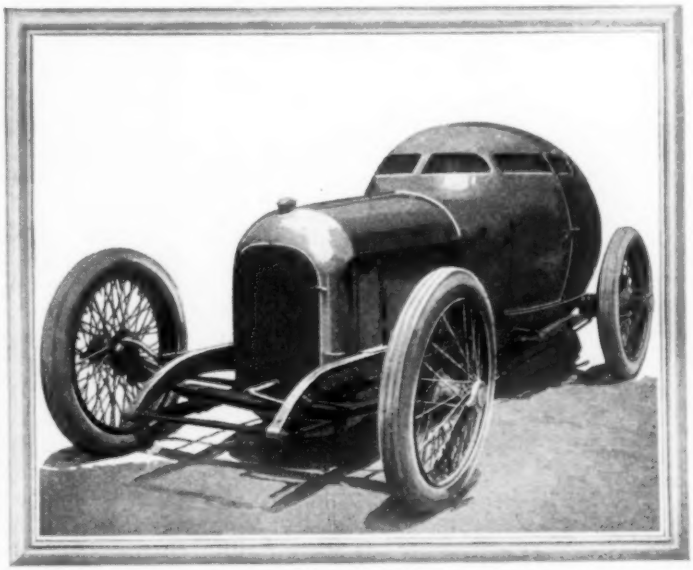
Gar Wood behind the Two Twelve-Cylinder Packard Engines in "Miss America VIII," in Which He Sped Over Ninety-Six Miles an Hour

How low the driver is seated in the car also affects the wind resistance, and therefore

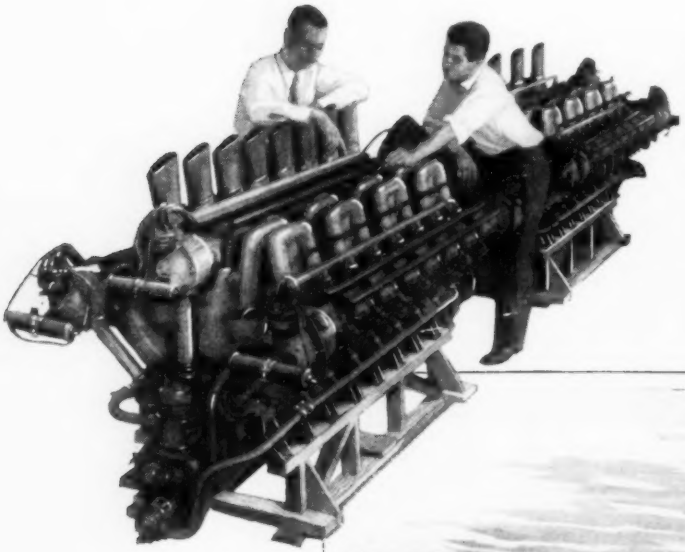


Kaye Don sits between two propeller shafts, whereas he would sit several inches higher if one propeller shaft were used. At first glance the body seems wider than necessary to accommodate the driver, but more careful inspection will show that the width of the upper portion is just sufficient for the driver and his arms, while the lower portion is somewhat wider in order to include the side members of the frame. To demonstrate how closely the car has been fitted around Kaye Don, let it be noted that Don had an asbestos suit specially made as a protection against fire, but the extra bulk of the suit made him too large for the car, and so he had to discard it for a conventional uniform of white duck.

The engines, of course, had to be specially built to "fit the driver," for there were no engines, sufficiently narrow and low, of suitable power. Likewise two engines had to be used, because one engine to replace the two would have been too broad and too high. Preliminary calculations showed that in order to provide 4,000 horsepower at 4,000 revolutions per minute, two twelve-cylinder Vee-engines, with a bore and stroke of five and one-half by five and one-eighth inches, would be necessary, giving a total piston displacement of 2,922 cubic inches, whereas the average American passenger car has a piston displacement of about 250 cubic inches. With two twelve-cylinder engines, having the bore and stroke just mentioned, the width and height of the engines were satisfactory, and yet the length of the engines was not too great—as might have been the case if sixteen-



Barney Oldfield's "Golden Submarine" That Rolled at the Then Record-Breaking Speed of 125 Miles an Hour Fifteen Years Ago



Giant Twenty-Four Cylinder Engines Built by Harry Miller; Below Ray Pregenzer Who Holds Outboard Speed Record of Over Fifty Miles

cylinder engines had been used.

The two vertical fins at the rear of the car are designed to keep the car on a straight course, particularly if all four wheels should leave the ground. Fundamentally, they perform the same function as the feathers in the tail of an arrow. Between the vertical fins is an "air brake," consisting of a flat plate two and one-half feet square. It is pivoted crosswise, and while the car is running it is horizontal. When the driver wishes to stop, he releases a lock which permits the plate to swing up vertically, thus offering considerably added wind resistance to assist in stopping the car. Also its rearward pull could be used to steady the car in case it began to skid.

The cost of designing the car alone is a sizable figure, as can be imagined when it is stated that over 3,000 drawings were made, requiring a large engineering and drafting staff. Each of these drawings meant that somebody, somewhere, had to make a special part, usually out of special material. Perhaps there was a pattern to be made, then a casting to be molded and machined, or an expensive die to be built and a forging produced. In addition, considerable experimental work had to be done, as, for example, wind-tunnel tests on body forms until the most desirable shape was found.

But what does speed mean to a man who has manufactured more of this commodity than any other individual? Let Harry A. Miller, of Los Angeles, answer.

"Speed on tracks, in water and in air," he explains, "means that manufacturers will advance more rapidly in developing alloy steels. Many manufacturers send us parts to test. They know racers will give them tests few laboratories could reproduce."

And just what manner of men are these who look death in the face and laugh at it and then go out and turn in a speed of 200 miles an hour or better?

The question was once put to Fred J. Wagner, internationally famous race starter, who was quick to give their outstanding characteristic.

"Fearlessness," he said. "Absolute fearlessness! I have had opportunity, on and off the track for more than twenty-five years, to study the driver, and of the thousand and more that have come under my observation, I have known none that was not the personification of daring. Hairbreadth escapes from death they consider part of the day's work."

NEWSPRINT FROM PINE PULP MAY ENRICH SOUTH

White newsprint paper has been made successfully from slash pine, thus opening the prospect of a wholly American supply of both newsprint and high-grade book paper made from southern pine trees, possibly of all sorts. Southern pine long has been used to make yellow paper, but heretofore it was believed to contain too much resin to produce white paper. Slash pine, from which the samples of white paper were made, supposedly was the least capable of producing regular newsprint, but it whitened as easily and its fibers were as long as spruce. Experiments indicate that the same thing can be done with long-leaf and other pine.

REST TO FIT THE HEAD EASES WORK ON AUTO

To enable work under a car in ease and comfort, a flexible headrest for the autoist now is available. It consists of a soft pad for the back of the head and is mounted on a wire frame. The device is held in place by a band fitting around the head, so that it may be worn constantly in the shop or used only as needed. It takes the place of bricks, blocks and creepers and often saves time in jacking and blocking up cars. The rest also has found favor

Work under the Automobile Can Be Done in Greater Comfort by Using the Headrest Shown

with tourists who use it in place of a pillow.

Tiers of Wire Trays for Small Chicks and Pens for Larger Ones on a City-Lot Poultry Farm

CHICKEN FARM ON A CITY LOT LIKE TENEMENT BUILDING

Applying the methods by which scores of families are able to live in comfort in an apartment building covering small ground area, a California poultry raiser is growing 3,000 chickens in the back yard of a city lot of average size. The chickens never set foot on the ground, and the feat is made possible through unusual devices for housing the poultry in a sanitary manner in restricted space. The eggs are hatched in an electric incubator, then the chicks are transferred from a brooder to wire-inclosed trays piled in tiers of four and holding 100 chicks each, feed and water being carried in racks. When they outgrow these quarters, the fowls are transferred to restricted pens, holding fifteen each, with wire floors and boarded tops, backs and sides. A latticed front enables them to obtain food and drink. With intensive feeding and no chance for loss of weight through exercise, the birds are placed on the market several weeks earlier than when given more freedom. This arrangement is suitable only when the chickens are marketed for meat, as laying hens require more exercise than can be obtained on the city lot.

ALL-AIR LINE ACROSS COUNTRY CUTS TRAVEL TIME

Over a Canyon and Enioying Luncheon in the Air; Views of the Transcontinental and Western Air Line

Transcontinental journeys may now be made on regular schedule in thirty-six hours, allowing a night's stop-over at a hotel between plane hops. Under recently adopted regulations, the line is allowed to carry both mail and passengers. The service was started to meet the increasing demand for through air transportation, but the schedules are arranged so that the planes operate in connection with fast trains for those who wish to ride by rail part of the way.

SMOKE LESSENS FIRE HAZARDS ON LARGE OIL TANKERS

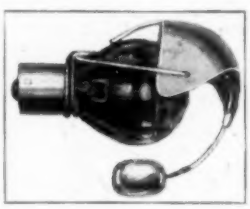
Smoke brought from the fire boxes under the boilers and put in the same compartment with highly combustible petroleum products has been found effective in preventing explosions on oil tankers. The method also has been used with success to lessen the danger of explosion and fire for petroleum stores on land and for oil in the production and refining processes. The secret of lessening the combustion hazard with the product of a previous combustion depends upon the fact that smoke, or flue gas, is composed of a large amount of inert gases that will not react with oil or its vapors to cause an explosion. This gas, thoroughly cooled and cleaned of soot, is pumped into oil compartments to replace air.

SCRUBBY BUSH YIELDS RUBBER ONLY IF UNCULTIVATED

Guayule, an unimposing, scrubby desert bush of the sunflower family, and the source of America's new home-grown rubber, will produce only when left to fight nature for existence. It will not stand much coddling, and certain luxuries of cultivation, including irrigation, cause it to vegetate and produce an immense amount of worthless brush. If forced to endure a drouth of several months and to fight for a living, however, it produces a multitude of fine droplets of rubber all through its larger stems and roots, high-bred strains of the bush showing as much as eighteen per cent of the total weight in pure rubber. It was found growing wild in the arid desert regions of Mexico, and experiments have been conducted with hundreds of varieties in selecting the best rubber-producing strains for growing in the central valleys of California where there is comparatively little rain for months out of the year. Tests with guayule rubber in auto-tire formulas indicate that it is nearly equal to tropical rubber in tensile strength and elasticity.

GLARE SHIELD ON AUTO LIGHT HELPS PREVENT ACCIDENTS

Automobile headlights are automatically adjusted to prevent glare when the car is going up or downhill with a shield now on the market. It is easily adjusted over the bulb and has a pendulum at the bottom. This tips the shield to the proper position to compensate for the angle of the car when it is ascending or descending. The device concentrates the rays on the road and is said to eliminate practically all the usual glare that sometimes causes serious accidents in driving.



Fourteen-Hole Miniature Golf Course Constructed by School Pupils to Assist Them in Mastering Geography

GOLF COURSE BUILT BY PUPILS TEACHES GEOGRAPHY

Pupils of a Sacramento, Calif., school have constructed a miniature golf course as an aid in mastering geographical and agricultural features of the United States. The fourteen-hole course is complete in every detail, the various sections representing parts of the country, and the hazards their agricultural products.

MECHANICS IN YACHT RACES BARRED FOR FUTURE

British and American yacht-racing authorities have agreed to eliminate the "mechanical" yacht which came into fame during the 1930 races for the America cup. Modifications provide that all class-J yachts, including all of the America cup contenders, must carry a mast weighing at least 5,500 pounds bare, that standing rigging shall not be set up or worked below the upper deck, and that the craft shall be fitted with "reasonable" living accommodations.

The Training of

By SGT. EDWARD KANE
of the Boston Police Department
as told to John F. Coggswell

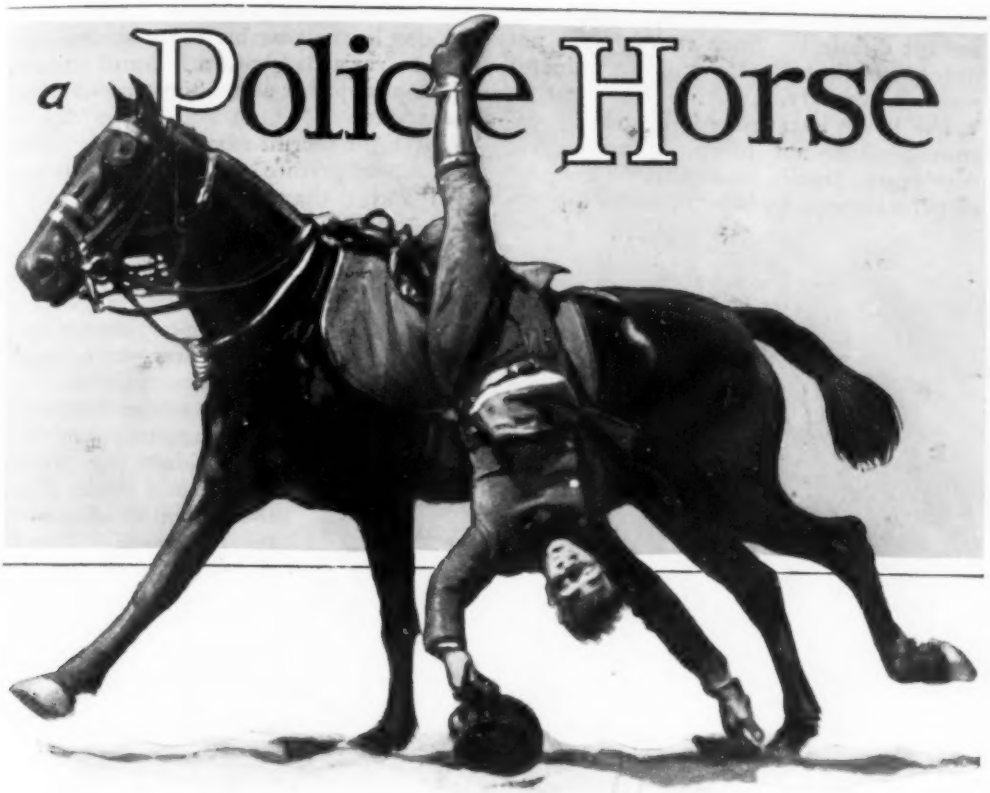
THERE'S something about a man on horseback that gives him ascendancy over the pedestrian. Perhaps the feeling akin to fear that inspires the person on foot toward the mounted man is a flare-back to medieval days when the mark of superiority, on the highway or the battlefield, was the riding of a horse.

I have seen a line of foot officers forced into the middle of the street by a forward surge of a crowd. Then I have seen a single mounted man come along and force that same crowd back onto the sidewalk and make them stay there. At one of the greatest waterfront fires that we have ever had, two mounted policemen succeeded in holding a crowd of thousands in check and out of danger, when twenty-five foot officers had failed.

Motorcycles and automobiles play a big part in getting police officers where they are needed in

Policeman James Pryor in the Saddle, Teaching His Mount the Difficult Lesson of "Passing" to the Right, a Useful Maneuver in Handling Crowds; Note Position of Horse's Legs in Circles

a Police Horse



Practicing Trick Riding; These Exercises Are Entertaining and Helpful to the Men and Are of Equal Benefit to the Horses in Getting Them Accustomed to Unexpected Maneuvers

a hurry. But nothing has been found, nor do I believe ever will be found, to take the place of a trained horse in handling a crowd, whether it be a violent mob, peaceful onlookers jamming the thoroughfare to view a parade, or a streetful of Christmas shoppers. But if that horse is not perfectly trained to his job, he is a menace instead of a protection to the citizens he and his rider are expected to look after.

It takes at least a year to train a horse in the elements of police work. Even when he has gone through days, weeks and months of schooling, he is still just a rookie when his rider takes him out for his first official day's work, as there are many angles of the job that he can learn by experience only. But before we start training him, we must get the horse, and there are few that, in type and temperament, are suitable to become police mounts.

A horse, to be acceptable for police duty, must stand about sixteen hands (sixty-four inches) high, weigh in the vicinity of 1,000 pounds and be not over six years old. He must have almost perfect feet and strong, heavy legs. His chest must be deep, his withers low and his back just right for a saddle. Possessing these features, he presents the general conformation of a good saddle horse.

Once taken onto the force, the new horse enters into an increasingly strenuous course of preliminary training—sort of a grammar-school education. This course requires from three to five months, according to the intelligence of the animal. Every detail must be shown to him over and over again, for horses have no ability of progressive reasoning. They learn nothing except by experience.

In this period of his training, a police horse is either made or spoiled forever. The trainer must always keep the upper hand of his charge, but he must never frighten the horse or do anything that breaks his spirit. To strike or kick a

horse is, in our department, grounds for instant dismissal. Such treatment is not only cruel, but it also ruins a valuable piece of property.

The horse is taught his lessons by encouragement, not by punishment. He soon learns that if, from either dumbness or perverseness, he fails to master a problem, he will have to go over it again. And he also learns that his every achievement will be rewarded with a lump of sugar, a piece of apple or something else of which he is fond.

First, the recruit must be gaited. Saddle horses for private use are usually taught five gaits; the police horse learns but three—walk, trot and gallop. At the end of a "longeing" strap, attached to a "cavesson"—a headgear similar to a light halter—he is taught the proper gaits.

One officer holds the longeing strap while another leads the horse around in a circle. Then the animal is allowed to try it himself. Usually a young, green horse will hesitate or stand still. Then the assistant goes back to his head,

German Trainers Giving a Horse a Lesson in "Noise Endurance"; Reliable Police Horses Must Become Accustomed to All Sorts of Sounds; Below, Gait and Drill Practice at the End of a Strap

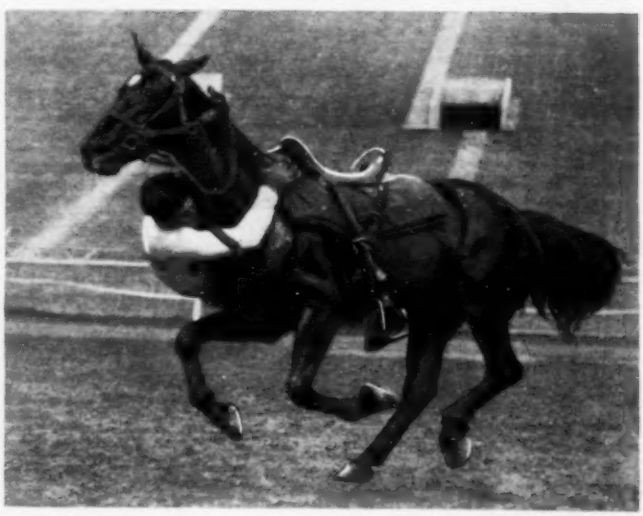
pats him and talks gently to sooth the pupil's nervousness, and starts him on his way again. Over and over, this is done, until the rookie horse understands what is required of him. Then he is ready to be taught how to trot and gallop and to change gaits.

In these first steps of making a police horse, infinite patience and gentleness are required. Almost always, the horse wants to do the right thing; the real problem is to show him what is wanted. Just like youngsters in school, some learn fast and some are mighty slow.

© Underwood & Underwood
Mounted Policeman Taking Hurdle and Firing at Dummy during British Exhibit, and, Below, a Well-Trained Canadian Horse

Besides earning a living by working—and working hard—a police horse is always on show as well, and the public demands that he put up just as good an appearance as the thoroughbreds in the horse-show ring. So, right from the start, we teach him to arch his neck. When he is back from his gait practice, he is given a few hours' rest and then fitted with another contraption so arranged that four rubber cords pull in his chin and bring the arch into his neck. He is given very short doses of this at first—not enough to tire or fret him—and then the period is gradually lengthened. Soon he gets the habit of holding his neck arched at all times and nothing contributes more to fine appearance, unless it be the constant grooming that makes his coat shine like velvet.

Probably most readers have seen a police horse pushing back a refractory crowd. He puts his flank against those who refuse to move and shoves them aside just as a snowplow pushes snow off a road. To teach him to do this strongly, and yet in such a manner that he'll not trample or overthrow anyone, takes a lot of time, but it is worth it, as this is one of his most useful accomplishments. We call this "passing" to the right or left as the case may be, because, in order to execute the side movement, the horse must bring both fore and hind foot past those on the opposite side. A heavy pressure of the right knee against the horse's side sig-



New York Reserve and State Police Officers in an Exhibition of Trick and Fancy Riding; in Such Stunts, Almost as Much Depends upon the Horse as upon the Man

nals for passing to the left; against the left side, for passing to the right.

His "high-school" course at an end, the recruit is ready to enter college training—the college of experience and hard knocks that teaches most of us nearly all we know. The police horse's college is the city streets; he must be made to become used to all sorts of traffic conditions for his life's work is in the rush and turmoil of the downtown sections, amid clatter and hubbub, where false moves caused by nervousness might result in injury to horse, rider or bystander.

Of course, it is not possible to take a rookie into the busy streets at the start. With one of our best and most patient riders in the saddle, he is started in outlying thoroughfares where traffic is light. If a police horse ever needs a friend, it is during this period of his training. That's why it is always carried out by finished horsemen, who have a real love for and understanding of the mounts.

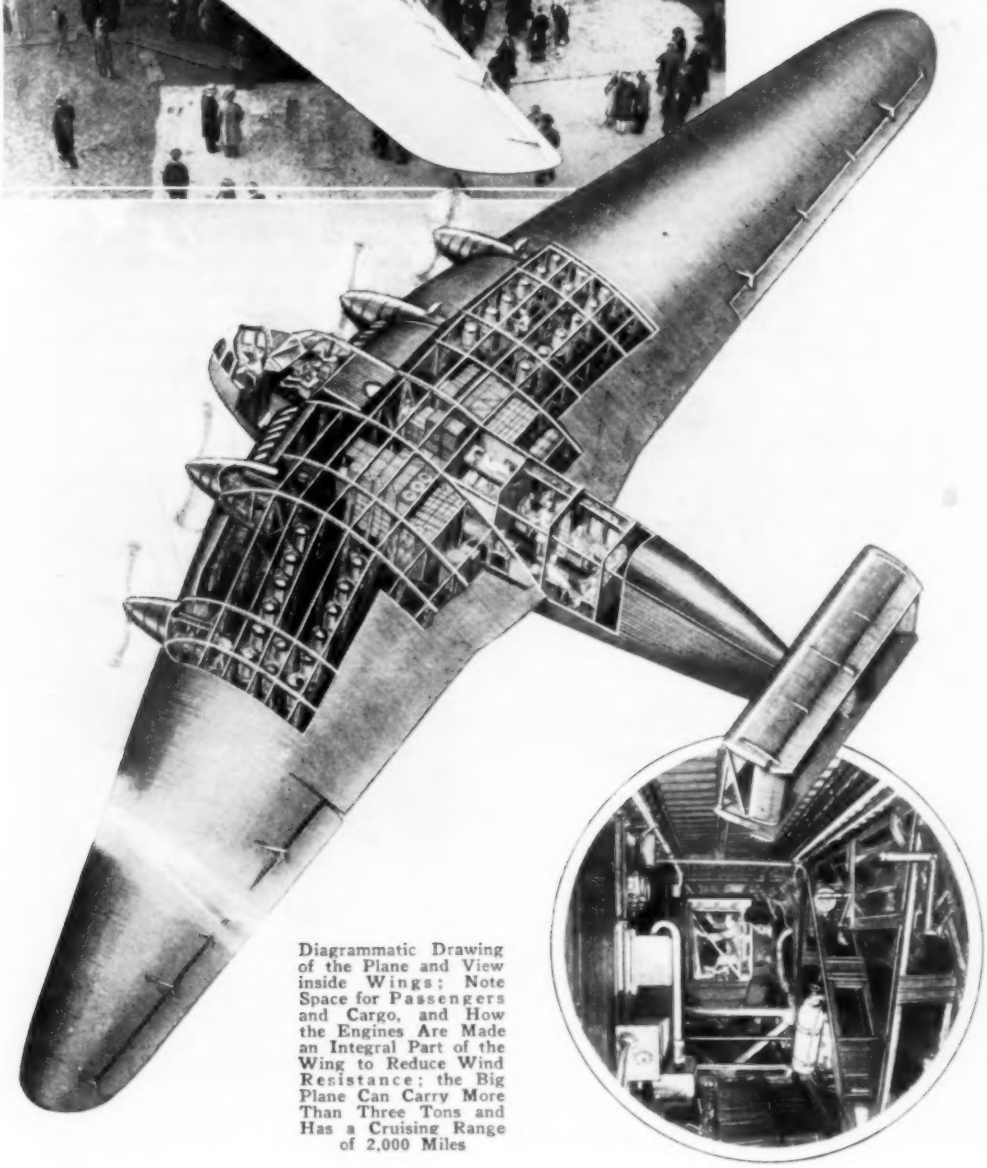
The rider soon ascertains what items of traffic frighten the animal, and then he, kindly but firmly, shows the steed that there is nothing terrible about it. Gradually the rookie is worked into thicker and thicker traffic and soon is taking his jaunts through the downtown streets without show of fear.

When he gets out on his regular job, the police horse still has a few things to learn. He must be taught to stand still in spite of anything, when his rider leaves him. The officer starts this training by giving his horse the command and then moving off a few paces. If the horse follows, he is led back and left again time after time. When he does stand and await the return of the officer, he is rewarded by a lump of sugar or some such tidbit, and soon learns what is required.

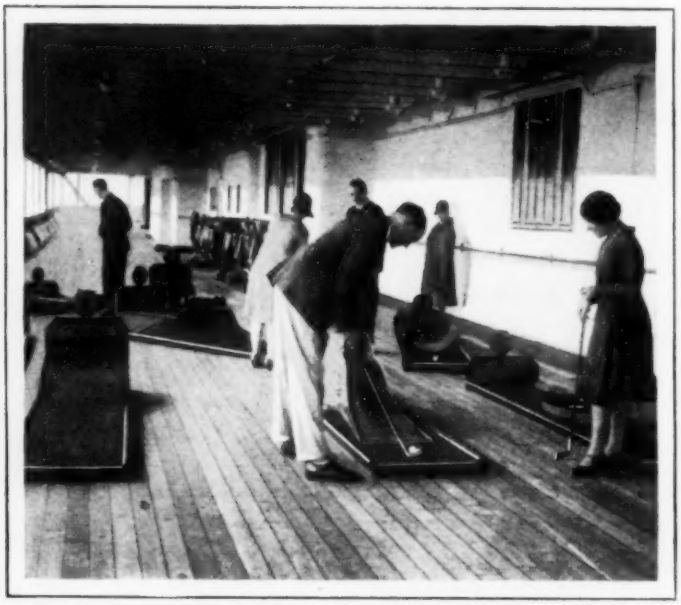
In the Boston department—and I believe this is the case the country over—no veteran police horse is ever sold. When he has passed his usefulness, he is sent to the S.P.C.A. farm and spends the remainder of his days browsing about green pastures and taking it easy. Which is but just pay for the full measure of loyal service he has rendered.

HUGE LAND PLANE TAKES CREW UNDER ITS WING

When He Was Last in Chicago, Dr. Hugo Junkers Told Popular Mechanics Magazine about His Plans for a Flying Wing; Here Is the Realization of What Was Then Largely a Dream; the Huge Plane Has Been Touring Europe and Attracted Thousands of Spectators Wherever It Landed



Diagrammatic Drawing of the Plane and View inside Wings; Note Space for Passengers and Cargo, and How the Engines Are Made an Integral Part of the Wing to Reduce Wind Resistance; the Big Plane Can Carry More Than Three Tons and Has a Cruising Range of 2,000 Miles



Enjoying a Game of Miniature Golf on the Deck of the "Majestic"; the Greens and Hazards Are Portable for Quick Removal

MIDGET GOLF ON SHIP DECK LATEST TRAVEL SPORT

Miniature golf has been added to the many sports that may be played at sea. One of the first steamers to install a course was the "Majestic," ample room being found on the huge decks for a layout similar to that used on the land courses. The fairways and greens are surrounded by rims in order to keep the balls from being lost overboard, something that has limited golf play when the seas are rough.

TRAVEL BY TRAIN OR TROLLEY SAFER THAN AUTO

Riding a street car is twenty-two times safer than an automobile, and a railroad train is thirteen times as safe as the auto, analysis of nation-wide accident statistics shows. These results were computed on the basis of passenger-mileage records and fatalities, as officially reported, and have led safety officials to suggest that auto drivers would do well to follow the practices which have made the street-car and railway lines so secure, if they would reduce the annual death toll. The records show that, throughout the country, automobiles travel 11,400,000 passenger-miles to each fatality, railroads 16,450,000 and street cars 34,760,000. These figures include fatalities both to passengers and others. The results are more striking when considering the hazard to passengers only. For each passenger fatality, the automobile travels 20,840,000 passenger-miles, the railroad 270,240,000 and the street cars 455,000,000 miles.

GOLDFISH SKIN CAN BE TANNED FOR SHOEMAKING

By a tanning process recently developed, shoes and slippers now can be fashioned of fish skins after the skins have been subjected to the curing methods like leather. One of the products of this process is a golden slipper in striking shades and colors, made entirely from tanned goldfish skins.

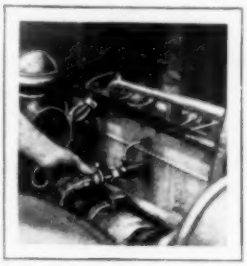
Golden Slipper Made of Goldfish Skins After They Were Subjected to Curing like Leather

CHEMISTS AIDED IN WAR ON LEPROSY BY CELL STUDY

In the hope of finding a way to cure the disease, chemists have undertaken a study of leprosy germs just as they have been investigating the germs of tuberculosis. It has been found that the two maladies are related in that the germs that cause them belong to the same family, and they grow in the same kind of cells in the human body, although leprosy is confined largely to the skin. The research will be aided, it is expected, by the work of a Japanese professor who claims that he is able to produce leprosy in rats by inoculating the animals with germs from human victims of the disease. This is the first time such artificial cultivation of the malady has been accomplished. Rats that had been fed on a diet lacking certain vitamins, and therefore were in a weakened condition, contracted the disease after the inoculation. The study may also lead to the discovery as to why these vitamins protect against leprosy, and another avenue of attack against the disease may be opened.

ELECTRIC WARMER FOR AUTO PLUGS IN LIGHT SOCKET

To facilitate starting in winter for the car kept in an unheated garage, an electric motor warmer now is offered which is plugged into a light socket, connected with the car and operated overnight. The heater is installed by drilling two holes, one in the cylinder head and the other in the cylinder block. The heating element, being contained in the water jacket, thus keeps the water in the radiator warm, which, in turn, heats the engine. The operating cost is practically negligible.



British Army Tank Demonstrating Its Effectiveness by Smashing through a Thick Brick Wall at Top Speed

BRICK WALL CRUSHED BY TANK IN WAR MANEUVERS

British army officials recently demonstrated the power and efficiency of the latest type of war tanks, when one of these lumbering giants was aimed at a strongly constructed brick wall during maneuvers. The fortress on wheels hit the barrier with terrific force and smashed through the masonry as though it had been paper, just as it might, in similar fashion, knock down the enemy defenses in actual combat.

WRENCH FALLING FROM PLANE CAUSES METEORITE SCARE

A farmer near Philadelphia recently heard a roar, a whistling sound, and then saw something hit the ground in a cloud of dust. A mineralogist hurried to the spot when the farmer telephoned that he believed a meteorite had fallen. Search showed that something had fallen, but the object was nothing but a wrench that had been dropped from an airplane flying at high altitude.

Why Go to the

Sketch of the Balloon with Sail in Which Andree Hoped to Reach the Arctic; Finding of Andree's Body and of Relics of Other Unsuccessful Northern Expeditions Attracts Fresh Interest in the Problems of Arctic Adventure

ICE vaults have cracked open and yielded the graves and equipment of nineteenth-century explorers whose death in the white wilderness had long been accepted.

A radio message out of the "dotted circle" told the story of Salomon August Andree, found on lonely White island. Several weeks later, Maj. L. T. Burwash, in a brilliant aerial dash over the north magnetic pole, found graves and relics of the John Franklin expedition on the shores of King William land.

When men leave their bones scattered all over the Arctic, when a single party of 135 succumb to scurvy or privation, we are moved to ask the full meaning of Arctic exploration. Men have battled the Arctic for ten centuries, and it still is invincible, defiant.

The Alaskan gold rush is over, but the white north still lures men into a dismal empire of ice. The price of this adventure comes high; only the hardy survive, and the financial rewards are small. Even remembering the tragic death of past explorers, men are yet determined to conquer the Arctic, if for no other reason than to learn the fate of lost expeditions.

The last of the great Arctic disappearances concerns Roald Amundsen, who had discovered the south pole and crossed the north pole in the "Norge." Thereafter it was no secret that he and Umberto Nobile had severed relations over a division of honors. Each sought to berate the other. Seeking to vindicate himself as airman and explorer, Nobile organized and led a new Arctic expedition in the airship "Italia." The craft came down on

Arctic?

the Arctic ice and, for some days, the crew was lost to civilization. Nations waited in trepidation. Amundsen was asked, more in jest than in seriousness, whether he would attempt to rescue Nobile. "Certainly," he declared without hesitation.

A few days later, a French Latham seaplane skimmed off the bay at Tromso, carrying Amundsen at the head of five men, bound for the bleak waste which held the "Italia." Events took an ironical twist. Another expedition found Nobile, but Amundsen never returned. The Arctic vastness closed over him. Down he came, no man knows where, and now his footprints are buried deep in snow.

The purpose behind most ex-

Courtesy Explorers Club

Above, Pilot W. E. Gilbert Entering Record of Flight during Which Relics, Supposed to Be from Sir John Franklin's Expedition of 1847, Were Found; Below, Artist's Conception of Sir Franklin's Last Stand

fringes of the ice pack.

The north's resources are not limited to hunting and fishing. Beyond the limit of trees, there are about 5,000,000 square miles of ice-free land. In favored places on the mainland and islands, plant life attains a luxuriance that surpasses all expectations. Western Ellesmore island and northwest Greenland are noted for their vegetation.

ploration is the extension of knowledge. With reference to the Arctic, it resolves itself into two classes, the kind which will ultimately allow man to adapt the region to schemes of colonization; secondly, the kind which enlarges on such general subjects as meteorology, glaciation, fishing, earth history, tides, currents and earth magnetism.

Does modern exploration pay? Take the case of Roald Amundsen's "Norge" expedition. At a cost of $150,000 it was learned that the polar basin has a depth of about 12,000 feet, casting doubt on a notion that there is land on the European side of the pole. Also, this expedition explored about 100,000 square miles of unknown region.

Above, Map Showing the Five Poles in the Arctic, and Below, Chart of the Air Routes, the Shortest Lines between Great Cities

Oil and furs first brought the Arctic into commercial importance. The most approachable lands have already been devastated and exploited by trappers. Hunting cannot last, but since the demand for pelts grows apace, it will be necessary to breed animals on Arctic farms. Unless governments step in, the whaling, seal and walrus industries also will suffer and need artificial stimulation. Of all Arctic animals, the polar bear will endure longest, because it lives remote from the

Vast tundras are the natural breeding grounds of caribou, reindeer and muskox. Reindeer supply meat, leather, milk and clothing, and are the most valuable asset of peoples living in the Arctic's rim. In a classic experiment, the U. S. department of agriculture demonstrated that Arctic grazing grounds can support a good animal population; 1,280 reindeer introduced into Alaska before 1902 have multiplied into a herd of 500,000, and it is estimated that there is sufficient pasturage for another 2,500,000.

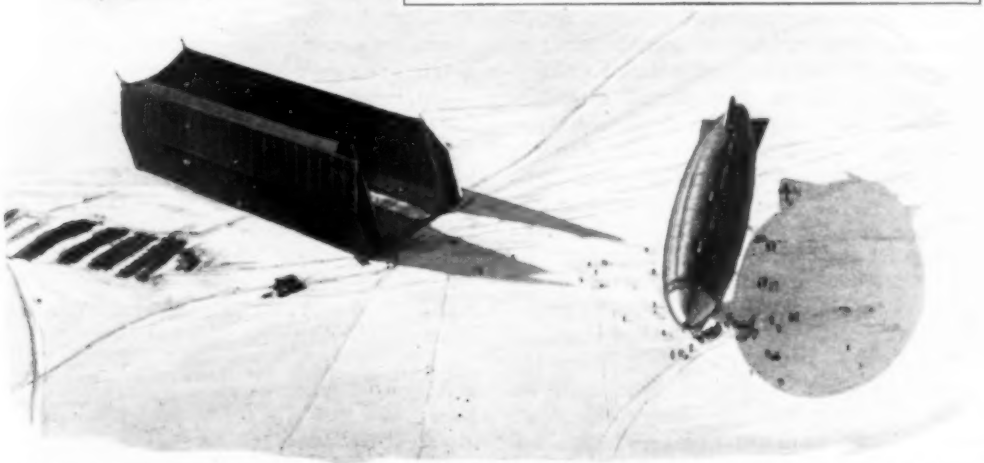
Within twenty years it is expected that Alaska will ship 1,000,000 carcasses of venison to the United States annually—the equivalent of 3,000,000 sheep. And what can be done in Alaska can be re-

located in large areas of Canada and, possibly, Greenland. Stefansson calculates that the Arctic regions can support 100,000,000 reindeer and 500,000,000 muskox. Muskox is valuable for meat, leather and wool.

It is unlikely that important new lands will be discovered in the Arctic. The polar continent is mythical, since it is really a polar sea. However, there are many mysteries waiting. Nicholas land, found by Russians in 1913, has still to be investigated. The Beaufort sea, north of Alaska and to the west of the Canadian Arctic archipelago, has never been penetrated, and the mystery of Peary's Crocker land needs an explorer. There is strong possibility of new undiscovered islands in the Beaufort sea.

C. E. P. Brooks recently disclosed a remarkable relation obtaining between the amount of ice in the Labrador-Greenland currents and precipitation in the British isles. This is a definite result of Arctic exploration. Continued study of the fluctuation in the extent of Arctic sea ice may aid long-distance weather forecasting.

In September, 1930, Major Burwash charted the north magnetic pole by aerial camera for the first time. This presages a similar record for the four other poles recognized in the Arctic regions, namely, the geographic north pole, which faces



Perilous Photography in the Arctic; a Cameraman Recording Progress of Bear toward His Ship, and, Below, the Dirigible "Norge" and Its Hangar

Members of the British Expedition to the Frozen North under Comm. Frank Waiseley; in the Future, Explorations from the Air Will Probably Supplement Many Tedious Ship Voyages Such as This

south in all directions; the ice pole, known as the pole of inaccessibility until Amundsen, Ellsworth and Nobile flew over it in 1926; the wind pole at about the center of Greenland, and the pole of cold.

The exact location of all these poles is indefinite. British and German expeditions are now seeking to pin the pole of wind on the map. The pole of cold is thought to lie on the Arctic circle in Siberia. The pole of ice is nearest the geographic pole, about seven degrees south of the meeting point of all meridians.

Two poles, the north pole and the magnetic pole, are shifting. The former wabbles in a circle having a radius of about forty feet. The magnetic pole shifts regularly in conformity with mysterious changes in the earth's magnetic core. Its position is generally stated as latitude 70 degrees north, longitude 97 degrees west, on the Canadian mainland at a spot called Boothia Felix, green and grassy in summer and blinding white in winter.

Trans-Arctic commercial transportation is also in the offing. The shortest route between Chicago and Calcutta is over the Arctic, as well as the shortest routes between New York and Yokohama, London and Seattle. These air lines will come as soon as long-distance aircraft are developed. Sir Hubert Wilkins will shortly examine the possibilities of submarine routes under the Arctic ice packs.

Intensive polar expeditions are planned for 1931 and 1932 to establish the first scientific observatories in the Arctic. It becomes more and more imperative to learn the effects of Arctic weather conditions on temperate zones. Each year 10,000,000,000 tons of air shift from hemisphere to hemisphere, and the only way to understand this eternal migration of fluids is to explore the Arctic.

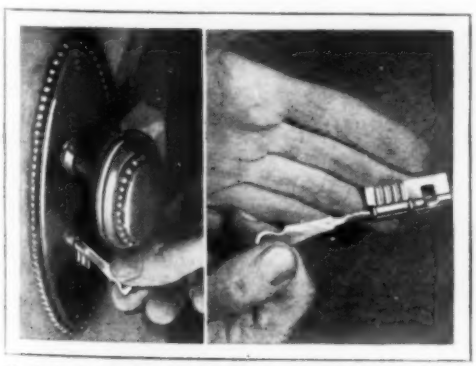
¶A motorcycle was exhibited recently in London whose saddle could be raised or lowered by pressure on the handlebars, and whose tires were inflated by pressure on the saddle.

SHINGLES MADE OF CLAY

Clay shingles, waterproof as well as fireproof, constitute a recent building product made in a variety of colors, sizes and shapes. They are fastened together with copper slating nails and can be laid in regular patterns or at random in different angles, thus giving a thickness of two or three layers. This thickness, with special hip and ridge tiles, makes the roof waterproof. The clay can also be treated to give an effect of great age.

LOCKING KEYHOLE HELPS TO FOIL ROBBERS

After locking the door, it is now possible to lock the keyhole as well with a small device that makes it impossible for a skeleton key or other instrument to be inserted. It fits inside the opening of a standard door lock and is, in effect, a detachable end for the doorkey and has a lug that, when opened, engages the side of the keyhole so that it cannot be withdrawn although the outer section of the key can be pulled out. The key cannot be withdrawn from the device when the lug is in the folded position.



Keyhole Lock Attached to Doorkey Which Makes It Impossible to Insert a Skeleton Key

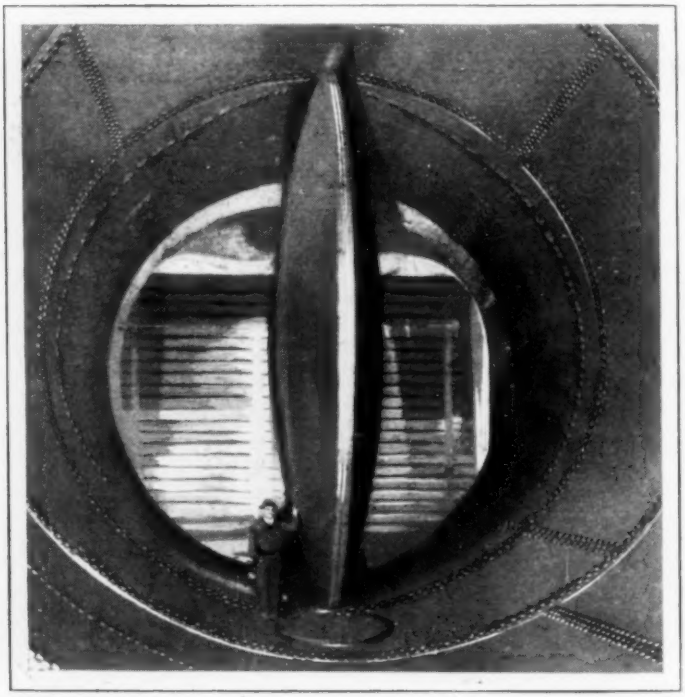
Not a Prison Scene, but a View of a Nursery in Which Young Trees Are Protected from Direct Rays of the Sun by a Slat Roof

SLATS PROTECT YOUNG TREES FROM RAYS OF SUN

Young trees planted in the nurseries of the United States forest service are protected from the direct rays of the sun by a slat roof which permits sunlight to pass through the interstices without injury to the tender seedlings. When the sun is shining, the slats give a queer striped effect to the entire interior of one of these nurseries. After the plants have become sufficiently hardy, the slat covering is removed.

OYSTERS YEAR-ROUND FOOD WITHOUT DANGER

Evidence that refutes the time-honored belief that oysters should not be eaten in the months without an "R" has been collected in France. In two coast cities where oysters are eaten the year round, typhoid falls in the four months without "R" in them. From this and other studies, it was decided there is no connection between eating oysters at any season and contracting typhoid fever.



Huge Butterfly Valve in the Conowingo Hydroelectric Plant; It Weighs 136 Tons and Governs 54,000 Horsepower

"BUTTERFLY WING" IN DAM CONTROLS VAST POWER

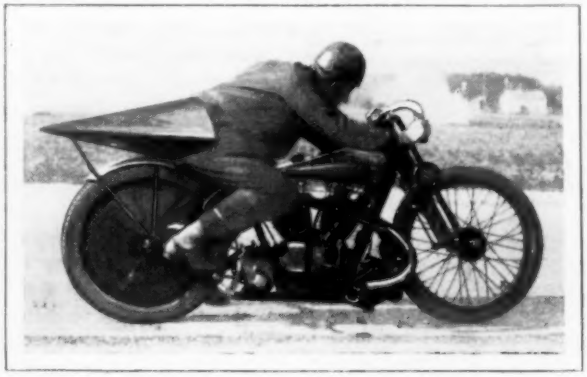
A butterfly wing that governs 54,000 horses is one of the interesting details of the huge Conowingo hydroelectric plant on the Susquehanna river. This wing is not the fragile thing of nature but a 136-ton valve, shaped like a butterfly's wing and given that name because of its close resemblance to the natural object. When closed, the valve wing withstands a water pressure of more than 3,000,000 pounds, and, when it is open, it allows 180 tons of water to strike the water wheel each second and so generate as much power as 54,000 horses. Nearly 3,000 men worked for two years to build the power dam and plant, which contains some of the largest water wheels that have ever been constructed.

SIGNAL WINDOW AIDS SEDAN DRIVER

So that the driver can more easily make arm and hand traffic signals, a sedan is equipped with a drop window panel having a full-width horizontal section about six inches deep. This section is pivoted below the main part of the panel and is opened simply by pushing against it. This gives an aperture for the arm signals. It can be left open or quickly closed and, when the entire window is lowered with the usual crank handle, the hinged drop panel is automatically returned to its vertical position.

IRON TAIL FOR MOTORCYCLIST REDUCES WIND SUCTION

To reduce wind suction at his back when traveling at high speed, an Austrian motorcycle racer, during his training for the establishing of a world's record, provided himself with a form of streamlining for his own body. The device consists of a conelike length of metal fastened to his back, the tip pointing to the rear. This tends to lessen the suction in the virtually airless space behind him.



Motorcycle Rider with a Streamlined Iron Tail Attached to His Back, to Reduce Wind Suction behind Him

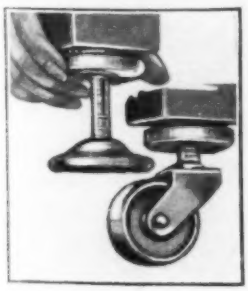
Rubber Airplane with Wings, Tail and Fuselage Made of Inflated Rubber Tubing; Note, at Right, That One Man Can Lift It

INFLATED-RUBBER PLANE CAN BE LIFTED BY ONE MAN

Radically different in appearance and construction from the ordinary type, a rubber airplane has been constructed by a Washington inventor. Wings, tail and fuselage are made entirely of rubber, covered with fabric. The rubber parts are kept rigid by inflating them with air, thus making the craft so light in weight that one man can lift it.

ADJUSTABLE CASTERS END WOBBLE IN FURNITURE

Adjustable casters or gliders now are available to eliminate the wobble in tables, radio cabinets, desks and other furniture without the necessity of placing wedges or cardboard under the legs. A locking disk permits the caster to be adjusted at any position to meet the floor. A quarter-turn of this disk allows the adjustable caster to drop to the floor, and a turn back tightens it in the required position.

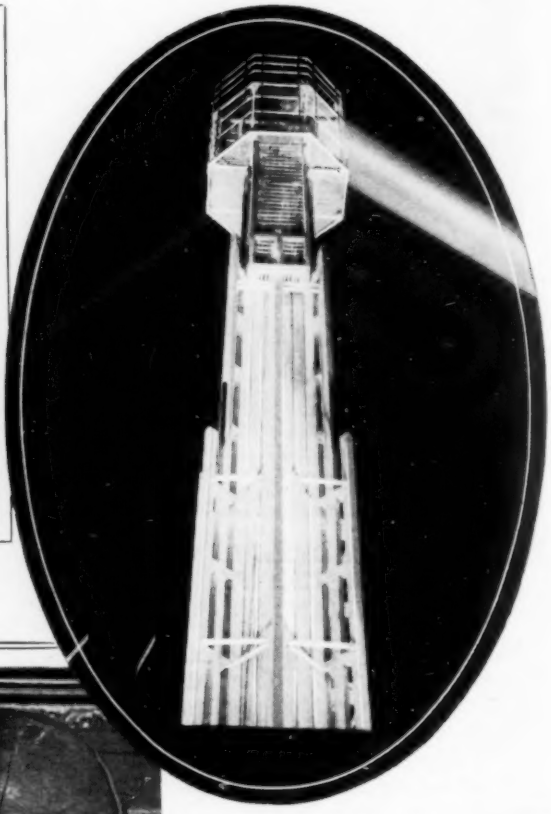


ELECTRIC BRAKES FOR TRUCKS SERVE TRAILERS TOO

At a touch of a button, the brakes are set on automobile truck, and trailer too, through an electrical installation developed recently. Depressing the button anew releases the brakes. Current for the mechanism is taken from the storage battery and is consumed only when the brakes are being applied or released.

WITH THE KEEPER OF A LIGHTHOUSE OF THE AIR

Clifford Laibly in Tiny Elevator That Runs to the Top of the Lindbergh Beacon, Which He Tends for the Guidance of Flyers



Night View of the Beacon Support, Looking Up into the Compartment Where the Light Revolves

Laibly at Phone Which Communicates with Watchman and Attendants of the Palmolive Building; at Right, About to Throw the Switch Which Turns on the Light; the Beacon Is Polished Daily, and, during the Time It Is Burning, the High-Intensity Carbons Are Changed Once an Hour; the Elevator Takes the Keeper About Twenty-Five Feet below the Light; the Remainder of the Journey He Climbs by Ladder; Warm Clothing Is Necessary during the Winter Watches

SKELETONS OF ICE-AGE WHALES ARE FOUND IN MICHIGAN

Fossils of seagoing whales have been found in two localities in Michigan, one in the northern part of the state and the other not far from Ann Arbor. Prof. Russell C. Hussey, of the University of Michigan, believes that the animals swam inland by way of the St. Lawrence or the Hudson waterway some 20,000 or 30,000 years ago and became trapped in the comparatively shallow waters of the rivers at the edge of the retreating ice sheet. Unable to return to the ocean, they eventually starved to death. Their bones were cast up on the beaches and became covered with gravel from which they have been excavated. Both skeletons were in a good state of preservation.

TREE PLANTER SETS TEN ACRES OF SEEDLINGS IN ONE DAY

Doing the work that ordinarily would require twenty men, a tree-planting machine is being employed to aid reforestation work in New York state. It can cover about ten acres a day, the trees being planted six feet apart. Two rows are placed simultaneously, the machine digging the hole and pressing the dirt about the seedlings. Two men operate the planter, which reduces the cost of setting out young shoots as compared with the slow hand process.

Tree-Planting Machine Which Can Cover About Ten Acres a Day, Doing the Work of Twenty Men

Combination Sundial and Telescope, Showing the Mirror and the Adjustable Eyepiece to the Left of the Man's Hat

TELESCOPE AND SUNDIAL ARE COMBINED IN ONE

One of the latest decorative units for the lawn or garden is a combination sundial and telescope with which accurate time can be told and distant objects, including those of the heavens, studied. Images are reflected from a polished concave mirror through a prism and to a magnifying eyepiece. All the parts are easily adjusted so that the telescope can be used with accuracy and comfort by night or day. If desired, the mirror and eyepiece can be removed and taken indoors for safekeeping, but may be left outside without risk of damage, as they are thoroughly protected. Both dial and telescope are mounted in solid bronze. One of the novel uses for the telescope is for the study of birds.

¶ More than 93,000 physical examinations of candidates for pilot licenses have been made by the government.

The Latest Electrical

By DON GLASSMAN

THE PRESIDENT of a mid-western university was addressing several thousand students in the school's new auditorium. Acoustics were bad. He lifted his voice, but it could not convey his introduction of a speaker, Dr. Sergius P. Grace, assistant vice-president of the Bell telephone laboratories.

When Doctor Grace came forward, he met vacant stares. Students saw the speaker plainly, but did not expect to hear him. For a full minute he stood speechless. Noises gave way to an expectant hush.

Opening his mouth, the first syllable crashed like thunder. Doctor Grace had a voice that boomed, cracked and reverberated in every far corner. He roused them out of lassitude. His words and acts opened the doors of a great laboratory where men practice witchcraft with electricity.

First, Doctor Grace relieved suspense by giving away the secret of his voice. Unlike the radio announcer, he was not talking into a visible microphone. But how should the students have known there was any other kind of a microphone? That was the reason for his coming—to reveal what had not been heard about.

"Well, here's my voice," he said, taking an object no larger than a

Doctor Grace Dialing Number That Is Reproduced as Speech, and Showing the Pocket Microphone

Giving School Children Hearing Test through Phonograph Device Developed in Bell Telephone Laboratories; Volume of the Sound Is under Constant Control

quarter out of his breast pocket. "It's a portable microphone, made to my order. I don't like to distract you, or to inconvenience myself, by having to remain on one spot. Microphone wires run down through my clothes to a contact on my heel."

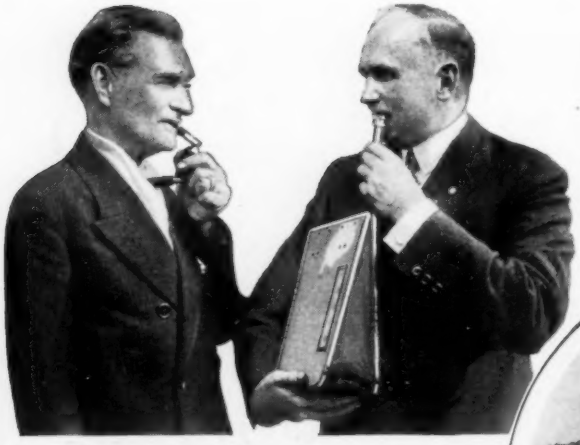
This man is a detective, engineer, speaker, demonstrator, entertainer and sorcerer rolled into one. He takes the place of traveling magicians who roamed about the country thrilling people with their bag of tricks. Doctor Grace travels on behalf of the Bell laboratories, but instead of a bag, he carries a truckload of tricks.

Recently he was addressing a Chicago audience when he picked up a telephone and dialed. Before the spectators could catch another breath, they heard a voice from New York repeat in good English the exchange and number Doctor Grace dialed, thus: "S——— One Oh Oh Four."

It was the first demonstration of such unique communication. "I did it," he said, "to illustrate the trend in long-distance telephony. The use of dial phones for local calls paves the way for an extraordinary expansion of automatic telephony. Long-distance dial phones are still in the experimental stage, but when our leading exchanges get new equipment, it will be possible to dial a number 2,000 miles away, as well as one around the corner."

The apparatus which converts dial impulses into human speech is termed the "call announcer." It can be adapted to telephone exchanges. Telephone patrons will dial numbers, but the operator will hear them spoken. The whole arrangement is simplicity itself. The numbers were originally spoken into a moving-picture microphone by a young woman with a well-modulated voice. This strip of film, inserted into a machine, is the voice ready to speak any hour of the day. A dial impulse is trained to ask the film for a number, and a loud speaker makes the canned voice audible.

Everybody is familiar with devices to

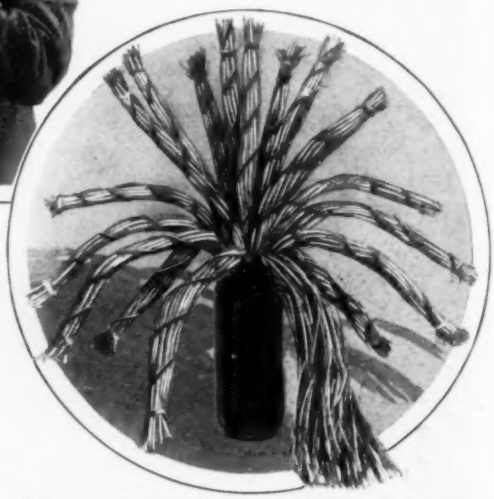


improve the hearing of deaf people, but now comes a method for projecting speech electrostatically into the brain. Doctor Grace speaks a sentence into a telephone transmitter, and it comes to the audience through amplifiers. Simultaneously, part of the electrically reproduced speech is stored in a "delay" circuit. After remaining in "storage" for four and one-half seconds, the current returns as a high-voltage impulse and passes into Doctor Grace's body. Now he is the transmitter. He points his index finger into the ear of a man, who hears the original sentence repeated in his brain. No sounds are heard as this man receives Doctor Grace's voice, but he can testify that he has heard it distinctly.

"The eardrums and surrounding tissues are made to act as one plate of a condenser-receiver," explains Doctor Grace. "The vibrations impinging against the eardrum are interpreted by the brain as speech, or music, whatever the sound might be."

Inversion of speech is another trick in Doctor Grace's truckload. He holds a telephone transmitter to the mouth and speaks the cryptic sentence, "Fay-o-bonno Jay-cutt Play-a-feen Crink-a-nope." The transmitter is connected to apparatus which translates these unintelligible words into understandable English. Two seconds after the audience has heard the inverted speech spoken, the loud-speaker horns shout, "Allegheny Mountain Telephone company." In the event of war, inverted speech will become a major weapon of the belligerents. Inversion can take place both from code to English and vice versa. Doctor Grace thinks that the inversion apparatus may also give grammarians the cue for a whole new language.

To invert speech, you merely turn the frequencies upside down so that high frequencies become low frequencies and vice versa.



Using the Artificial Larynx, and End of New Ocean Cable Which Contains 3,600 Wires

Using modulators, demodulators and filters, Doctor Grace reinverts gibberish into intelligible language.

Doctor Grace went on to describe the loading coil and telephone repeater, now employed on the toll and long-distance lines of the Bell system. These devices allow the passage of voice messages over wires no larger in diameter than an ordinary pin, whereas, under the old method, copper wires with the thickness of a lead pencil were necessary to perform the same service.

He brought out the recently developed high-power double-end vacuum tube, necessary for short-wave telephony across the Atlantic. "The receiving antenna at Schooleys mountain, N. J., receive transatlantic impulses so weak," he said, "that a million of them would be necessary to light an ordinary incandescent lamp."

Creeping speech! Five feet above our heads hung a tightly wound metal spiral, similar to those used on screen doors. Doctor Grace pointed to it, then spoke into a telephone transmitter. He made a

circular motion with his finger, indicating that his speech was creeping along the wire at a snail's pace. Not that we could see his voice slow down to a speed one-twenty-fifth of that with which it travels through air, but that we soon heard it. It required two seconds for the first word to come out of a loud speaker.

Transmitting Speech through the Finger Tips, and Device That Shows the Magnetic Properties of Metals

Next, this necromancer brought forth a device which enables dumb people to speak. The mechanical larynx, it is called. It includes an electrical ear and brain, as well as a mechanical lung. Any dumb person who at one time enjoyed the power of speech, can address himself to other persons or send his voice through the telephone. If one wants to create a basso-profundo voice, it is only a matter of turning a screw; likewise for the feminine voice.

It is possible for any person to speak words without making noises in his throat. The artificial larynx makes speech where there is none. The air waves created by jaw motions are transmitted into a rubber mouthpiece and thrown against a vibrating membrane. The speaker holds his artificial lung under his arm and against his chest. By gentle pressure of the hand, this lung, acting as a bellows, feeds air into the short hose and aids in the amplification of waves coming from the mouth.

PRIZE-WINNING WASTE BASKET TO AID CITY CLEANLINESS

Impressed by the fact that women, and men too, often dislike to raise the soiled lids of waste receivers on the city streets to deposit rubbish, James Herman, a student in the Art Institute of Chicago, designed a receptacle that would eliminate this objection and would invite co-operation in efforts toward city cleanliness. His suggestion won a $500 prize, offered by the committee of twenty on street and outdoor cleanliness of the New York Academy of Medicine, over 195 other ideas submitted. Mr. Herman's basket can be attached to a pole or to a flat surface by a specially designed lock that prevents theft. The second prize went to Denzil Hinr, a student of Washington University.

LARGE PONY-EXPRESS STAMP HONORS EARLY RIDERS

Large Pony-Express Stamp Placed on Cross-Country Mail Planes to Honor Early Riders

Commemorating the heroism of the early riders who blazed the first cross-country fast-mail trail in 1858, large replicas of the original pony-express stamp recently were placed on the transcontinental mail planes that today cover the same route. The pony-express riders traveled from the Atlantic to the Pacific in twenty-six days, and the mail planes cover virtually the same route today in thirty-six hours.

ULTRAVIOLET PICTURES ADD TO HUMAN KNOWLEDGE

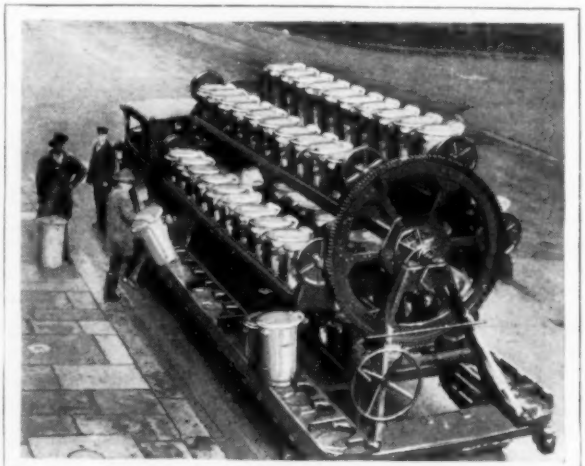
Discovery of a new process of photography with the invisible ultraviolet rays promises theoretically about nineteen per cent more detail for certain kinds of objects. The latest method employs a microscope for the camera's eye. The rays have been used before to take photographs, and the recent development is the discovery of how to use another form of ultraviolet light for this purpose, that part of the invisible radiation which is nearest to visible violet light. Ultraviolet pictures of hollyhock pollen grains revealed new details that were not shown with the visible light, but a similar picture of a certain worm was less clear than one taken by white light. The worm was found to have a protective skin against the invisible rays.

HELIUM SUITED FOR HEATING AND ALSO COOLING

Helium, the non-inflammable gas used in dirigibles, also may be used in the future for both heating and cooling, as the result of experiments which have been reported to the American Chemical society. Because of its high conductivity of heat, helium is a good medium for circulation in heating and refrigeration systems. Used as a preservative for food, helium keeps other gases which encourage decay from reaching the perishables.

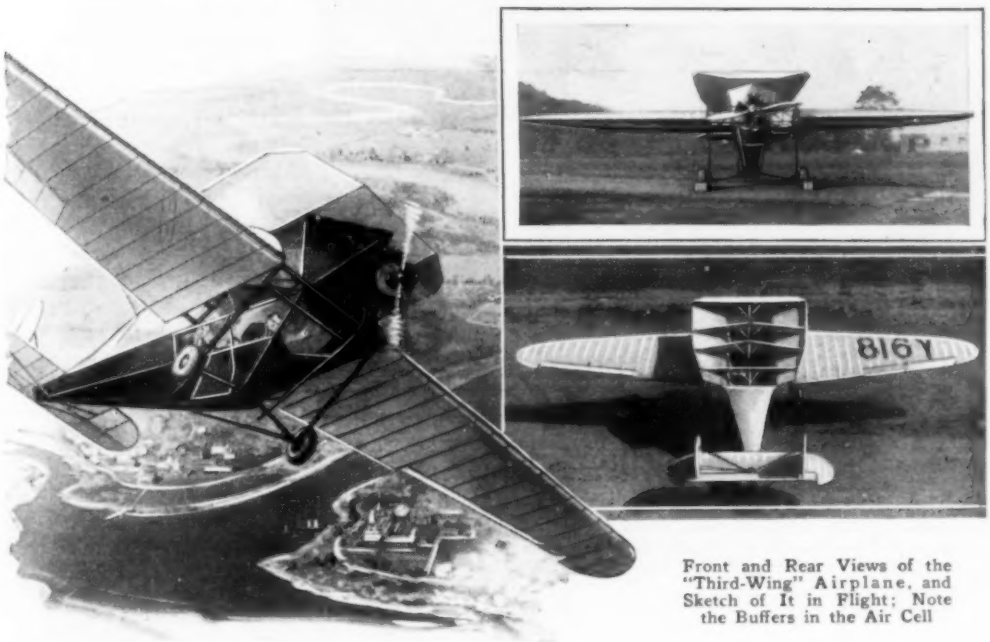
ROTARY SWEEPER FOR STREETS SAVES LOADING TRUCKS

Street refuse is swept directly into cans with a rotary sweeper introduced in London. This saves handling loose material in trucks, reduces dust and saves time, as the machine need not be stopped for unloading. The cans, eighty-four of them in all, are arranged in rows. As they are filled, empty ones are substituted, the full cans being set aside for later hauling away and emptying.



Rotary Street Sweeper Which Deposits Refuse Directly into Cans, Thus Saving the Handling of Loose Material

THIRD-WING AIRPLANE OFFERS GREATER SAFETY



Front and Rear Views of the "Third-Wing" Airplane, and Sketch of It in Flight; Note the Buffers in the Air Cell

Interesting flying tests with an experimental airplane designed by Edward H. Lanier, Cincinnati inventor, has attracted attention to the unusual features of the ship and its performance. It is of monoplane design, but in reality has three wings, the main wing being separated from the fuselage by a gap of twenty inches on each side, and the top of the fuselage flares out to the sides, forming an open, hollow cell of high lifting efficiency. Within this cell are lateral air buffers which create an area of low pressure when the plane is in motion. Air, rushing up between the side wings, also increases the lift and gives greater stability both vertically and horizontally, the tests proved. In landing, the air cell on top of the fuselage has a retarding effect, due to suction, enabling landings at lower speeds than are possible with the usual plane. In taking off, the plane requires a run of little more than 100 feet and has left the ground at a speed of but thirty-two miles an hour. It lands with a roll of not much more than twenty feet under normal air conditions. Pilots declare that the plane is easily maneuvered and stable under adverse factors. Tests are to be continued in an effort to reduce the weight of the plane and to increase its speed. Mr. Lanier has taken out patents on his designs and has others pending.

SMELLY GAS TO SAVE LIVES ACTS AS SIGNAL

Workers in metal mines are to be warned of fires by a gas of very disagreeable odor, which, in time of danger, is mixed with the fresh air in the ventilating shafts. In addition to the use of an odor as a signal, the American Standards association also provides that, in mines equipped with electric lights, these shall be flashed nine times in three series of three flashes each. Since trouble may develop in the electrical system, however, the miner's nose is relied on to detect danger. Experiments have been conducted with pleasant odors, but disagreeable smells were found to exert a much more positive effect. The odors, injected in the air lines, can be tolerated without much discomfort, as only a few parts per million parts of air are needed for their detection, and none of them can exert any harmful influence.

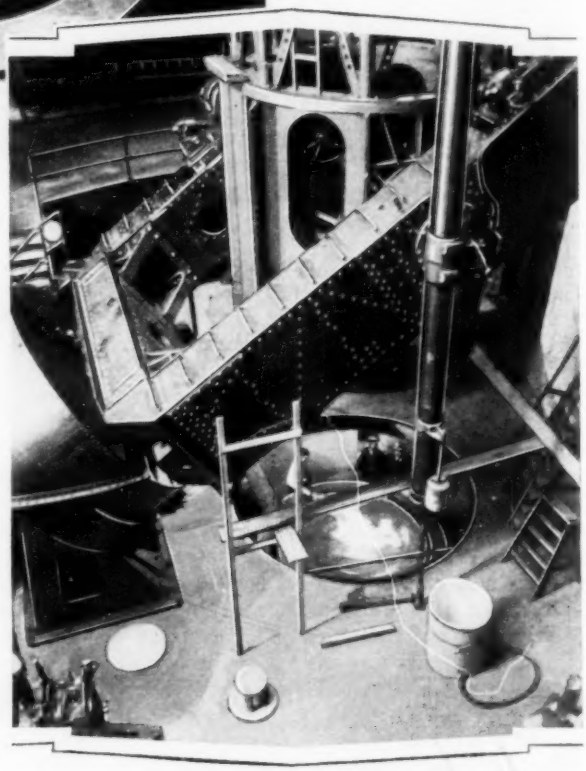
Removing Excess Material with Chamois Skins after Silvering the Mirror, and Looking Down into the Well

TELESCOPE'S FIVE-TON EYE IS RESTORED WITH SILVER

Treating the five-ton mirror of the huge reflecting telescope at Mt. Wilson with a fresh coating of silver, was the interesting task of expert workers recently. The huge unit had to be lowered into its well by means of the elevating screw and approximately twenty-four hours were required for the entire operation. It took two and one-half hours to lower the mirror and the same time to raise it back into position.

FISH-CATCHING BIRDS KILL ENEMIES OF TROUT

Herons and other fish-eating birds are often blamed for killing game and commercial fish when, in fact, they usually benefit these varieties by destroying other more deadly enemies. The more valuable fish not only are fewer in number than the non-commercial kinds, but they inhabit deeper waters, are swifter, and hence harder for the birds to catch. The birds, feeding on what is common and easy to get, therefore catch many more of the coarse fish, some of which are enemies of commercial varieties, than game fish, and feed likewise on insects, crustaceans, frogs, snakes and other creatures. Trout fry are much more likely to meet death from other fish than from birds, although the birds often get the blame. Except at fish hatcheries, it is probable, according to the biological survey of the department of agriculture, that fish-eating birds more than make up for the harm they do eating game fish by their destruction of other natural enemies of the whole fish tribe. An examination of the stomachs of 150 blue herons disclosed that only a few game fish were consumed, while scores of enemies of the commercial varieties were found, including other kinds of fish, snakes, bugs and beetles.



BETTER ALTIMETER IS NEEDED FOR SAFE FLYING

Altimeters, as used on aircraft, still are subject to considerable error under certain conditions. On the day that the British dirigible "R-101" crashed in France, Dr. Hugo Eckener, designer of the "Graf Zeppelin," made a flight and found on landing that his altimeter still registered a height of 400 feet. This would indicate a considerable fall in barometric pressure on that day since the altimeter is simply a refined type of aneroid barometer indicating the height in feet due to the decrease in atmospheric pressure accompanying ascent. Unless during a flight the zero reading is constantly checked by readings from the ground over which flight is taking place, the zero reading throughout a trip corresponds to the ground-level reading at the point of departure. If the barometric pressure falls, or the ship passes from a region of high to one of low pressure, the altimeter will indicate a greater height than that at which the craft is actually flying. The speed of ascent or descent, particularly if rapid, causes the altimeter to err although after a time it returns slowly to the correct reading. This inaccuracy is difficult to estimate because the law governing the change is arbitrary rather than exact.

WIRELESS WALL LIGHT HIDES BATTERIES IN BASE

Equipped with its own batteries as an integral part of the fixture, a wall light that is independent of the lighting circuit in the home now is available. It operates on two standard flashlight cells which are installed inside the lamp. The light has no wires and is attached with two small screws, or can be used as a portable unit. It also is suitable for installation in an auto as a dome light or for a boat cabin. In the home, it is handy for temporary or emergency illumination, for closets, stairways or attics.

Amplifying Apparatus Consisting of a Megaphone in Metal Tubing for Aid of Partly Deaf

MEGAPHONE IN METAL TUBING AIDS DEAF TO HEAR

To enable partly deaf persons to hear, a California inventor, whose daughter is hard of hearing, has made a simple amplifying apparatus that is of particular use in schools for the deaf. It consists of metal-joint tubing containing a megaphone. The sound vibrations, intensified by confinement within the tube, reach the listener through earphones. A phonograph attachment to the megaphone makes it possible for the user to listen to music also.

POUCH FOR TOBACCO AND PIPE COMBINED IN ONE

With an interlocking fastener at the top, a combination tobacco pouch and pipe holder has been introduced. The pipe is secured by a leather strap that has a snap button, and the stem rests in a compartment just below the space for the tobacco. There is room for a generous quantity of tobacco; the pipe is kept from getting lost, and the entire unit is of a size to fit the pocket.

Firemen Giving the National Capitol Its Annual Bath by Turning Powerful Streams of Water on It

FIRE HOSE IS USED TO CLEAN THE NATION'S CAPITOL

Washington firemen are called on each year to give the national capitol its annual scrubbing. This is done by turning powerful streams of water on the structure from sidewalk to dome, washing off the year's accumulation of dirt and grime and leaving the building spick and span for the opening of congress.

TALKIES TO TEACH SOLDIERS LATEST ARMY METHODS

To instruct officers and enlisted men in various branches of the army service, the signal corps has begun the production of sound films to supplement the silent motion pictures that have been in use for instructional purposes for some time. After the World War, the army made about sixty-five movies of the silent variety and used them for lectures. Training methods have been revised and altered, making new films necessary in order to give the latest regulations, and the decision to incorporate the voice with the new pictures was made in the belief that the soldiers would learn more quickly, and that shorter films would be as effective, because the voice would interpret matters that would require extra scenes in the silent films; words of command will be given in many instances.

BEACH DEFENSE AGAINST SEA IS MADE UP OF MOVABLE UNITS

To protect the bathing beaches of the Baltic coast in Germany against encroachments or destruction by storm waves and spring tides, movable breakwater units have been used with success at several summer resorts. The units, shaped like curved overhanging baffle plates, are made of concrete and imbedded firmly in the sand in such manner that they present their concave surface to the water like a ship's bow. They are first placed a short distance from the shore line and as the receding waves gradually build up sand behind them, they are moved farther out until the beach has been extended as desired.

Portable Breakwater Units Shaped Like a Ship's Bow, Which Protect Bathing Beaches from Waves

With the Texas Rangers

Capt. John R. Hughes, Second from the Left, Leads a Scouting Party along a Winding Trail; Photograph Taken near the Big Bend in the Rio Grande

By GEORGE W. GRAY

A DUSTY automobile rattled northward on the road from the Shafter silver mines in west Texas. In the front seat sat two Texas rangers, returning from one of the emergency calls which frequently summon these officers to the Rio Grande border.

Suddenly the ranger captain touched the driver. "Stop her, Bill. There's something I want to take a look at."

The driver whistled in surprise as he saw the tall ranger bend down to examine a cluster of purple flowers. Presently he saw him dig the plant up and tie it snugly in his handkerchief. As he came back to the car the captain laid his find beside a box of ammunition. "Bill, if this transplants, I'm lucky," he said. It's a rare specimen."

And so it proved to be. Botanists at the state university were not familiar with the variety, and sent samples to the New York botanical gardens. There the plant was identified as a species of solanum—a rarity indeed, for it had never before been reported from any part of the States.

Seems odd doings for a Texas ranger, doesn't it? Spotting rare prairie plants hardly seems to go with spotting border bandits, protecting prisoners from lynch law, capturing desperadoes, and dealing with the fifty-seven other varieties of outlaw. For ninety years Texas rangers have been fearless regulators of the southwestern border, and between the bandits and the smugglers and the holdup men, their time has been pretty well occupied most of those years with fighting. An old pioneer etched the type when he said, "a ranger is a feller who can ride like a Mexican, trail like an Indian, and fight like the Devil."

Meet Capt. Roy W. Aldrich and you find a ranger who can qualify in many directions in addition to horsemanship, marksmanship, and an uncanny facility in dealing with bad men. A naturalist who has made a study of the plants, animals, and rocks of the southwest, a book lover who has assembled one of the most remarkable libraries of pioneer times to be found in any private collection, Cap-

tain Aldrich is a man of many hobbies. A few weeks after that incident on the Shafter road and when he spotted the rare weed, the governor of Texas sent officers to a certain town. It was the center of a new oil field, and its sudden prosperity had attracted the usual following of bad men. Crime flourished and the local officers did nothing, so Aldrich was told to take three men and clean up the town.

The party of four rangers arrived Saturday evening, and before midnight they had arrested eighty-seven men in one raid.

"How did you do it?" I asked the captain. "Weren't they armed?"

"After arresting them we picked up pistols all over the floor."

"But why should a gang of eighty-seven armed men drop their guns and surrender to four men?"

"Well, Sir, I don't know why they gave up. This was a hotel, with gambling on the third floor. We told 'em they were under arrest, and they seemed to agree with us, right off."

"But how did you make that arrest, captain?" I persisted.

"Shucks! We just went up there to the hotel. I sent two of my men up the fire escape to take 'em from the rear, and with the other ranger I pushed in the front way. We met a lookout man at the head of the stairs, and he ran—down the steps. Saw our guns cocked, I reckon.

"It was a big room with eight or nine tables and other gaming outfits, foggy with smoke. 'Boys,' I said, 'we're rangers from headquarters in Austin, and there's two more of us back at the fire escape.' There were murmurs all over the room, and then the sharp clattering noise of guns falling to the floor. I reckon nobody wanted to be taken with a pistol on him."

Capturing eighty-seven men in one haul is one thing. Standing off a mob of a thousand is something different. This latter experience was in another Texas county where a woman and child had been killed. The murderer had been positively identified by a girl who had witnessed the crime. A mob threatened to lynch him, but the district judge was determined to keep the law in his own hands, so he telegraphed to Austin for rangers. Aldrich was sent with three men.

"After the trial," related Aldrich, "we came down the courthouse steps with the condemned man, taking him back to the jail. A thousand men and more were massed in the yard. They were in ugly mood. You could just feel it. Everybody seemed on edge. You can bet that we marched our prisoner across to the jail with our rifles cocked.

"Of course, it is sheer nerve that takes you through in a situation like that. We

Where Many of the Members of the Texas Rangers Are Recruited: One of the Cowboy Camps West of San Antonio during Meal Time about the Chuck Wagon

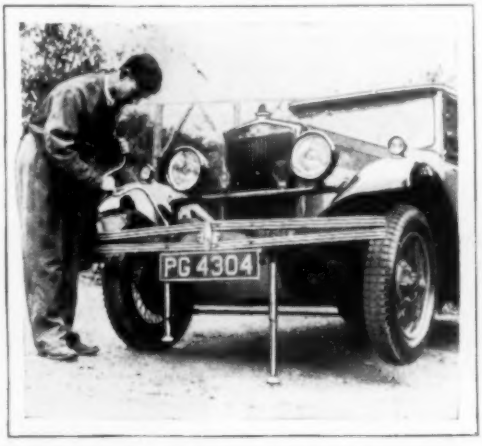
simply looked at the ringleaders with an eye that meant business. If the crowd had pulled shooting irons and gone into action, we couldn't have lasted long. But we'd have got a good many of them too—and the leaders first—and they knew it."

Aldrich lives on his farm of 110 acres, in a fine old plantation house, in the outskirts of Austin. Animals vie with plants in making his home unique. When I last visited there, I saw deer, a prairie wolf, two javelins (wild hogs), a coon, a ringtail, skunks, squirrels, prairie dogs, chachalacas (Mexican pheasants), and an alligator—all living together in peace. The wild ducks fly up from the creek occasionally and disappear into the blue, but they always come back in a day or two and feed out of the captain's hand.

Upstairs in the plantation house are two immense rooms lined from floor to ceiling on all four walls with shelves of books—works of history, geography, hunting, sports, anthropology, zoology, botany and other sciences. The captain has tried to collect every book ever printed about the Texas rangers, and I suppose he has succeeded, for this corner of his library is packed. He has many rare volumes on Indian fighting and pioneer life.

AUTO JACKS INSTALLED ON CAR MAKE TIRE CHANGES EASY

Changing tires on the road is greatly simplified by the use of a set of jacks installed permanently on the auto. They are attached inside the bumper to the frame of the car, and raising a wheel is merely a matter of turning a crank inserted in the jack nearest the wheel to be repaired. The permanent set of jacks is inexpensive.



Permanent Jacks, Installed on Auto and Operated by a Crank, Save Time in Making Tire Changes

Sorter and Candler Which Automatically Tests Eggs, Weighs Them and Distributes Them into Five Different Grades

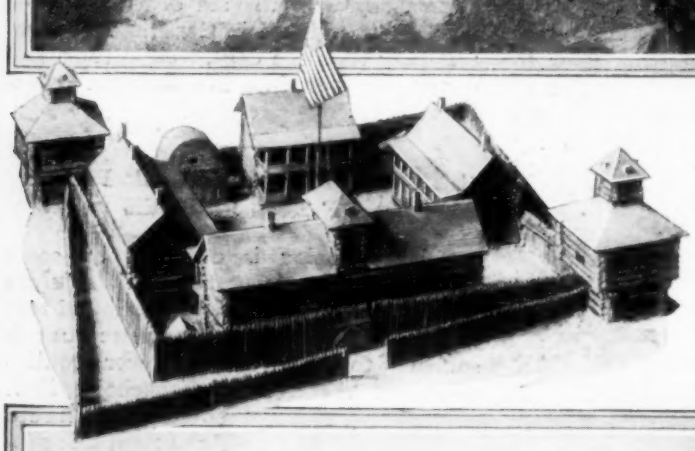
EGG SORTER AND CANDLER CAN TEST THOUSANDS DAILY

Five persons can sort and candle 60,000 eggs a day with the aid of an improved machine introduced in Germany. It automatically tests the eggs, weighs them and distributes them into five different grades for sale.

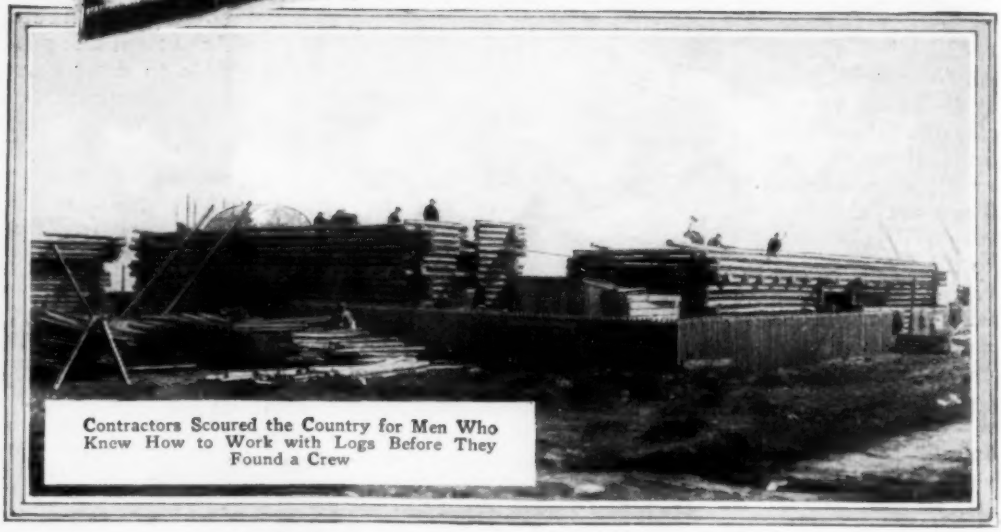
SUN IS SEEN AS POWER PLANT OF THE FUTURE

Solar radiation is expected by some scientists to represent the world's future power plant. One physicist has found that the sunshine falling on a house roof is sufficient to supply all the power requirements of the average household, if it could be utilized. At present it is possible to draw electrical energy from solar radiation, but it is not economical to do so on a large scale. Solar radiation is equal to 7,000 horsepower an acre, and there is sufficient power in one storm to supply the needs of a country for a century, if it could be controlled, stored and converted into electrical energy.

REBUILDING OLD FORT TESTS ENGINEERS' SKILL



Above, Reproduction of Painting by Paul Strayer, Showing Original Building of Fort Dearborn, and, at Left, Model Reconstructed from Drawing by Capt. John Whistler Now in the War Department Files at Washington; Below, Scene of Present Building as Workers Are Reproducing the Old Fort for Display at the Chicago Centennial Celebration in 1933



Contractors Scoured the Country for Men Who Knew How to Work with Logs Before They Found a Crew

Top Photo Courtesy American Bond and Mortgage Co.; Center, Courtesy Chicago Historical Society

LOST ART OF LOG BUILDING IS REVIVED FOR WORLD'S FAIR

Fort Dearborn, the historic log fort of early Chicago, is rising in replica, under the shadows of skyscrapers, for the city's centennial celebration in 1933. "I'd rather build twenty stories in steel than a job like this," said R. J. Sipchen, contractor in charge. "A skyscraper is simple in comparison. Why, building in logs is almost a lost art." Then he went on to explain some of the problems involved in faithfully reproducing the famous fort. In the first place, there was considerable difficulty in finding men who understood the art of working with logs. Then there was a hunt for suitable timber. Norway pine was located in the desired quantity and sizes not far from Duluth, Minn., and was transported to Chicago. The plans were drawn from an accurate model and from a sketch made by Capt. John Whistler, the grandfather of the famous artist. The builders of the original fort used man power exclusively, and workers on the replica were forced to follow the same practice except that horses were used to snake the logs into position. The whirr of an electric saw was about the only modern note during the construction, for nearly all the work was done with hand tools. More than 65,000 lineal feet of logs were dressed and shaped for the structure. To reproduce the effect of age, part of the bark was left on. Wooden pegs were used throughout, and the roofs were covered with split cedar shakes.

RUBBER CAP FOR MILK BOTTLE KEEPS CONTENTS CLEAN

Bottled milk and cream can be kept clean and free from germs by removing the paper cap on delivery and replacing it with a rubber cap which fits tightly over the top of the container. This cap can be sterilized by boiling, keeps the rim of the bottle clean and the contents free from ice-box odors, and also prevents spilling if the bottle is upset.

Giant Egg Laid Centuries Ago by the Extinct Elephant Bird as Compared with a Hen's Egg

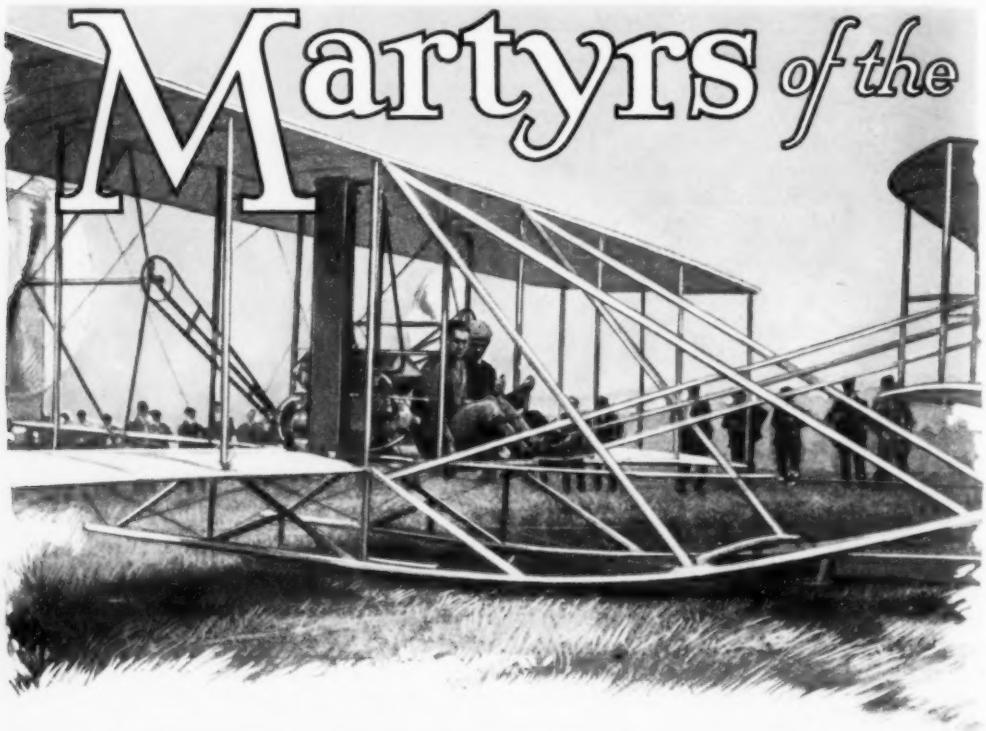
GIANT EGG OF ELEPHANT BIRD LAID MANY CENTURIES AGO

Worth more than its weight in gold, a rare and almost priceless specimen of the huge egg of the elephant bird has been brought to this country after having been dug from the sands of Madagascar, where it was laid many centuries ago. The bird that laid this egg is properly known as the æpyornis maximus, and in legend was called "the bird as big as a mountain." The egg is thirty inches in circumference one way, and twenty-six and one-half inches the other.

LIGHTS IN WINTER TRICK BIRDS INTO FLYING NORTH

Further evidence that light and not a change of temperature, is a fundamental cause for bird migration, is presented by William Rowan, of the University of Alberta, who tricked crows into flying northward even in the winter. By reversing the seasons with artificial lights, he procured the effect of the longer days of spring, although winter was near. After a period of this treatment, the crows were released. Many of them flew north.

Martyrs of the



Lieut. S. T. Selfridge, at Left, in Old-Style Pusher Plane at Ft. Myer; Shortly After This Photograph Was Taken, He Crashed and Was Killed; the Accident Led to Important Improvement in the Plane's Design

By CORLEY McDARMENT

A GREAT silver-winged air liner roars over a flying field. It banks sharply into the wind, glides down for a perfect landing, and rolls up to the "line" where the passengers leave their upholstered seats and trip down the little ladder to the ground. Everything suggests safety and comfort.

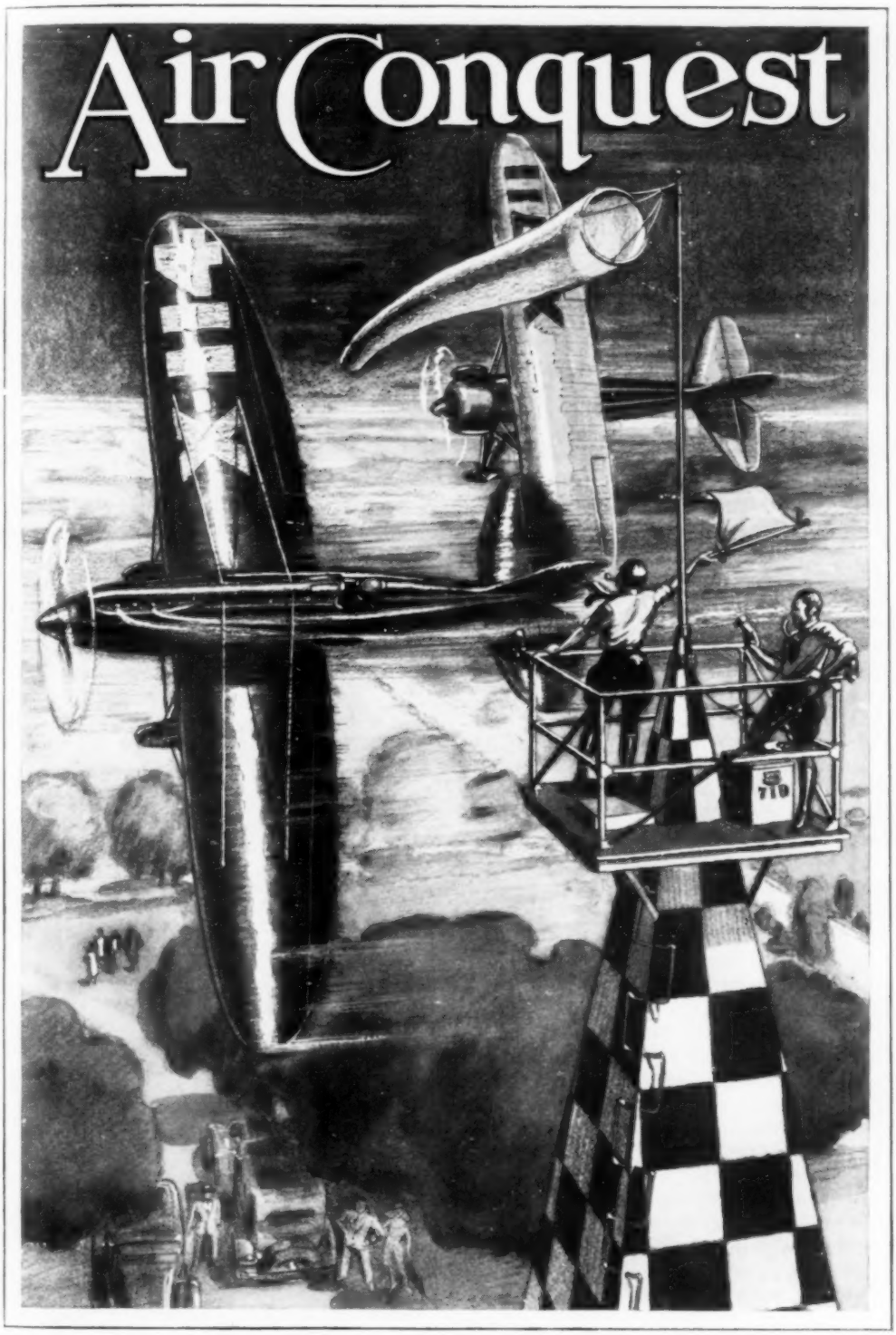
But every bit of the safety, and most of the comfort, in that huge air liner was bought with the highest fee in human life of anything outside a war. All progress has required sacrifice. Many trains were wrecked and hundreds of people killed in forcing the birth of the automatic switch. Steamships have blown up or been wrecked upon shoals with heavy loss of property and life in forcing the birth of new engineering ideas or foghorns and lighthouses.

Aviation, the most spectacular factor in human progress, was born in death and has been reared in the lifeblood of martyrs. Nearly every little trick connected with flying and airplane building has been learned by seeing men fall from the clouds to the earth.

"Let us avenge our dead!" exclaimed Bleriot, the great French flyer, in January, 1910, when he heard of the death of Delagrange who plunged to earth because his engine bed was not strong enough to hold the motor. Aviators have been avenging their dead ever since.

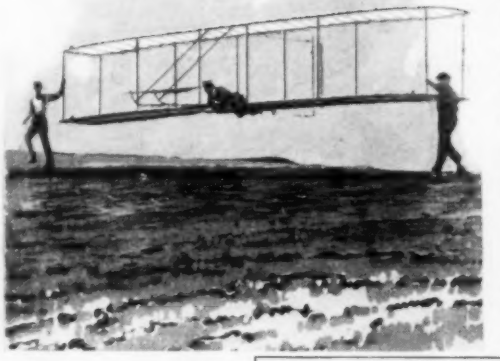
Men have not easily learned to fly, nor have they been very apt at building flying machines. Almost every lesson in maneuver and manufacture has been driven home by tragedy. Sometimes the lesson was learned by death coming in driblets, and at other times there was wholesale slaughter.

It took a lot of killings to find out for certain that an airplane needed a tail, that ailerons were necessary, that a rudder made for safety, that an engine bed had to be strong enough to hold the motor, that wing spars and ribs had to stand a lot of



Rounding the Pylon in an Air Race: Artist's Drawing Showing How Planes Bank Steeply at Low Altitudes; Note Timer with Radio-Phone Apparatus Which Is Connected with Chief Timer's Office

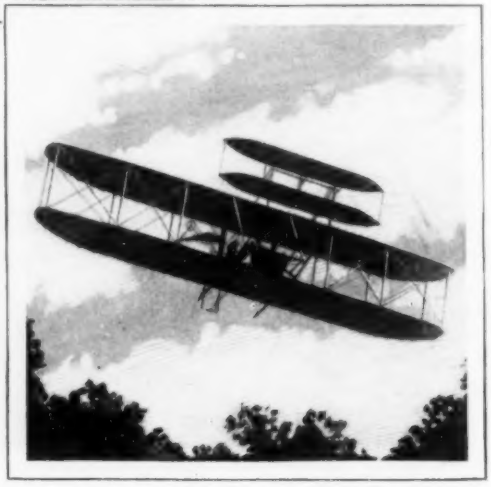
gaff, that hinge pins could break, that fittings could pull out and crystallize, that wing-tip flutter at high speeds had to be conquered, and that landing gears had to take a tremendous jolt. In the strictly flying end of aviation, it took a pile of dead to bring out the facts that a sideslip may be stopped by ruddering into it, that a tailspin may be checked by throwing the controls into neutral, that a downwind turn close to the ground is dangerous, that a stall may be tragic, that an airplane can easily toss a man out into the air if his safety belt is not buckled, that a sudden and steep zoom from a long fast glide may make a man unconscious, that there is no "flying instinct" in fog and darkness, that aerial navigation or "avigation" is necessary for long flights, that "dead-air" areas exist behind hills, that landings upon glassy water must be made with caution, that allowing a motor to get too cold in flight may cause stoppage at a critical moment, that the inclination to turn back to the field when a motor quits on the take-off is usually fatal, and that an obstacle on the landing field may be the cause of disaster.



Center and Lower Photos Courtesy U. S. Army Air Corps

From the earliest times men have been killing themselves in attempts to fly, but the real martyrdom of modern aviation did not begin until the nineties. On Aug. 10, 1896, Otto Lilienthal, a German scientist, was flying his glider in a strong wind. He had a line from his elevators to his head, but in a sudden gust of wind, he apparently failed to work his head properly and the glider came down, nose on, and killed the flyer. Lilienthal was using a curved-surface wing. He had made 2,000 flights with his gliders and proved that the curved wing would lift a man. His death pointed out that a better elevator control was necessary.

In 1908, one year after the Wright brothers had suc-



Otto Lilienthal's Glider; Wright Brothers' Glider of 1903, and Their Plane of 1908

cessfully flown with powered gliders, or airplanes, Lieutenant Selfridge, of the U. S. army, made a flight with Orville Wright, at Ft. Myer, Va. One of the propellers struck a wire connecting the rudder and main planes. This put the rudder and one propeller out of action and the opposite propeller took all the power to one side. The result was a smash-up and Lieutenant Selfridge was killed. But from that day to this no wires have been placed on an airplane where the propeller could come in contact with them.

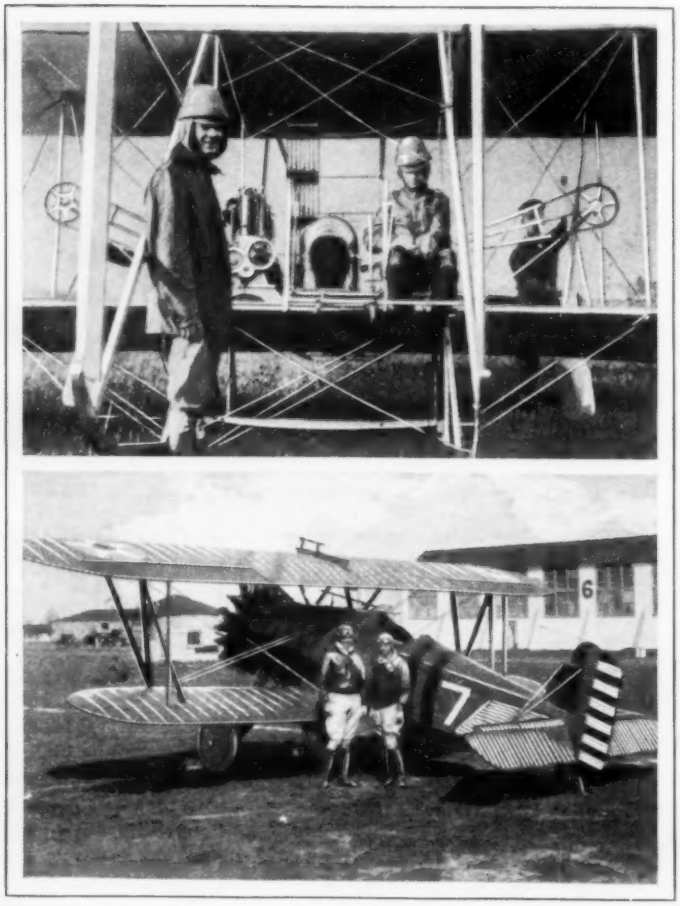
It is not possible to name all the martyrs of aviation outside of a book. There have been too many, and the causes of their martyrdom have often been complicated. But a peculiar thing about air accidents is the fact that the "reputation" which goes out about it has as much effect as the real cause.

Take the case of the "Eagle" crash in the summer of 1921, when Col. Archie Miller and six other prominent people were killed at Indian Head, Md. The real cause of this airplane wreck will never be known. But the news went out to aviators via gossip that all the passengers were piled down on top of the pilot in the nose of the plane. Since that day, all big passenger planes have had the seats fastened to the floor and safety belts are on every seat. Some planes have two or more compartments so that passengers cannot all fall forward in a heap if the plane gets into a dive. And the pilot is in a little compartment to himself.

Three Martyrs of Aviation, Cyrus Bettis, Lieut. Alexander Pearson, and Burt Skeel

In the case of the airship "Shenandoah," it was decided that a "line squall" helped break her up and dash her against the Ohio hills with fearful loss of life a few years ago. But the navigating gondola containing Commander Lownsdowne and other officers was wrenched loose from the main body of the ship and fell free like a meteor. Since then airships have had that gondola built up so close to the main bag and fastened so securely that it is not likely another similar mishap could occur.

The beloved John Rodgers, navy commander, came in for a landing at Philadelphia one day in 1926, crashed and



Nineteen Years of Plane Design; Top Photo Shows Ship of 1911; Below an Improved Army Plane of 1930

killed himself. He had to make an approach over water which was "glassy," and whatever the real cause may have been, the reputation was that the water deceived him, and every flying man of the navy remembers this incident and is chary of glassy water.

The death of Lieut. George Burgess and a newspaper correspondent, in the fall of 1925, in the Allegheny mountains between Washington, D. C., and Wheeling, W. Va., was one of a long string of accidents which had gone before in this "graveyard of cross-country flyers," and it hastened the establishment of weather stations and emergency landing fields in this area.

But the list goes on. It is not yet filled. Men and women are still sacrificing their lives in rounding out perfection in aviation. The great pioneers—the giants—have gone before, but the roar of mighty motors in huge silver-winged air liners that speed across the sky, reverberates against the scene of the crashes that made the thing possible.

SLEEP ON SHAKING BEDS TO STUDY NOISE EFFECT

Nine Colgate University students recently completed a period of nightly sleeping on vibrating beds while professors studied the effects of noise on rest and slumber. The "rumble" beds combined noise and vibrations in a way to imitate some of the sleeping obstacles of the machine age. The vibration produced was about equal to that experienced in a good automobile and was attained by hanging electric motors under the beds, allowing them to swing from the springs with their accessory apparatus. The noise was a hum a bit fainter than conversational loudness, and both noise and vibration continued all night. Although subject to further test and verification, the experiments showed that sleeping under such conditions tended to induce more headaches, more circles under the eyes, more unsteadiness on the feet, more buzzing in the head during the day, and more irritation from ordinary things. Students said time dragged more, they were prone to laugh at common occurrences, had more desire to be alone and less to engage in conversation, and required more effort to start to do routine work. Early results indicated that the belief that one can get used to noises is erroneous, because the effects of the second week were more severe. Previous experiments showed that noise alone increased blood pressure during sleep.

WHEAT CARRIED BY PIPE LINE FROM FIELD TO MARKET

Instead of hauling wheat eighteen miles over rough roads, several grain growers in the state of Washington send it from farm to railroad by pipe line. The grain slides through a one-inch galvanized iron pipe direct to the railroad station where sacking is done for some consignments, while in other instances wheat is run from the pipe directly into freight cars. Hauling costs about fifteen cents a bushel and the pipe-line method less than two cents.

ADJUSTABLE AIRPLANE WINGS ARE CHANGED IN FLIGHT

Adjustable airplane wings whose thickness may be altered while the ship is in flight have been tested recently to demonstrate the inventor's claim that their variable angles facilitate maneuverability and control. Through a combination of adjustable ribs within the wing, controlled by turning a crank in the cockpit, the wings can be flattened for high-speed flying, or the angles increased by making the wing section thicker for quick take-off, slow landing and added lifting power.

Adjustable Airplane Wing Whose Thickness May Be Altered to Increase Speed or Lifting Power

Removing Lighted Cigaret from the Coin-in-Slot Dispenser; the "Smoke" Is Ready in Five Seconds

READY-LIGHTED CIGARETS SAVE USE OF MATCHES

Cigarets are sold ready-lighted from a coin-in-the-slot machine introduced in England. Within five seconds after dropping a penny, the cigaret is expelled into a convenient rack at the base. The apparatus is thoroughly protected against fire hazards.

METAL ALLOY FOR SMALL BOAT IS LIGHTER THAN WOOD

Lighter than wood and impervious to sea water, a metal alloy known as "Birmabright" has been used with success by one English manufacturer in making small boats. The principal drawback to any kind of metal for small craft has always been that the parts must be so thin, to attain lightness, that insufficient metal is allowed for countersunk rivet holes or for welding. Enough thickness can be provided with aluminum, but it was found that this metal did not weld well for this purpose. The alloy has been used in building a sixteen-foot boat formed of three castings, and a twenty-two-foot craft built by a cast-framing system. One advantage of such boats is that they can be shipped in parts and assembled locally.

Thoroughly Modernistic Church at Prague Which, Except for the Crosses, Might Easily Be Mistaken for an American Factory

CHURCH LOOKS LIKE A FACTORY EXCEPT FOR CROSSES

Strikingly different in appearance from the conventional house of worship, a church thoroughly modernistic in design has been completed recently at Prague. The exterior of the structure might easily be taken for an American industrial plant, except for the glass-inclosed half-cylindrical column inside of which is the auditorium, and the crosses which surmount this section and a tower at the opposite end.

¶A telephone that not only records a caller's communication, but also tells of the owner's absence and, in addition, can be used as a radio receiver, is the invention of a Swedish engineer.

GREATER FIRE RISK MAY RAISE PLANE INSURANCE RATE

Fire losses of airplane hangars and contents, which, during 1929, amounted to about $690,000, jumped to approximately $1,800,000 during the first six months of 1930, insurance statistics show. If the rate of increase continues, the cost of airplane insurance, which in the case of a small plane often averages seventeen per cent of the operating cost, may be raised even higher. Insurance companies have suggested that each airport designate an official as a safety engineer to enforce regulations against smoking in hangars, fueling of aircraft or motor vehicles there, and other uses involving fire hazard.

QUEER APPARATUS PLAYS COLOR MUSIC

Experiments in producing music or rhythm in a symphony of color, rather than sound, have been carried on for years with apparatus capable of repeating a limited number of colors in succession. Lately, however, there has been constructed in Prague, Czechoslovakia, a complicated mechanism, known as a kinetical light plastic, which permits the composition of colors in an arbitrary rhythm, thus making it possible to interpret musical notes in terms of shades of color. Probably the most curious and complicated part of the apparatus is the audio structure shown here.

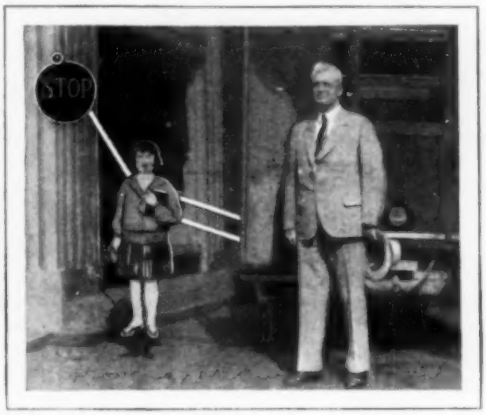
NO COATINGS KEEP WOOD FREE OF MOISTURE

While certain kinds of coating are more effective than others, none is able to protect wood completely from moisture absorption, the forest service has found after fifteen years of experimenting with all sorts of paints, varnishes, enamels and other materials. The tests showed that aluminum-leaf coatings mixed with paint or varnish were most effective, that a few asphaltic and bituminous paints had good moisture resistance and that the application of extra coats of spar varnishes gave better results. The addition of pigments to varnishes made them more resistant to moisture, the experiments revealed. The coatings were applied according to approved methods, and the results were tabulated.

Moving an Eight-Story Office Building Weighing 11,000 Tons; the View Shows the Structure After It Had Been Turned Around

SCHOOL GIRL'S FIGURE GUARDS PASSENGERS LEAVING BUS

Children riding in school busses in one section of Indiana are protected from approaching traffic as they leave or enter the vehicle by the swinging figure of a school girl which projects from the rear of the bus on the left side. The brightly colored figure is four feet tall and bears a warning sign. When the bus is in motion, the warning is folded into the rear of the coach, and when it stops, the little girl is swung into visible position by a lever located in the driver's compartment.



Swinging Figure of Girl at Rear of School Bus Guards Children from Approaching Traffic

EIGHT-STORY BUILDING MOVED BY EIGHTEEN MEN

Eighteen men recently moved an eight-story Indianapolis building weighing 22,000,000 pounds a distance of fifty feet in one direction, turned it around and rolled it a block in another direction to make room for a new structure. The building housed the general offices of a telephone company and 600 girl operators and other employes continued their work of answering calls as the building was moved. In the structure itself elevators ran, and gas, steam heat, water, electric power and sewage facilities were maintained through flexible connections. The average rate of movement was about fifteen inches an hour, but the occupants were unable to detect any motion.

Strange Adventures

© J. Herbert Witham

By HAROLD T. WILKINS

"A mountain guide has discovered thirteen skeletons lying in a gorge, near Remus, Switzerland, with rifles of an obsolete pattern lying alongside, where they are believed to have been for more than fifty years."—A recent news cable to London.

THIS grim story of a forgotten tragedy is one of a number of queer episodes and adventures in the strange happenings which daily befall Swiss professional Alpine guides and mountaineers, who, each spring and summer, rope themselves at the head and tail of a chain of tourists, hack steps in the snowy glaciers with their ice axes, and anxiously watch the visitors ascend the ice walls.

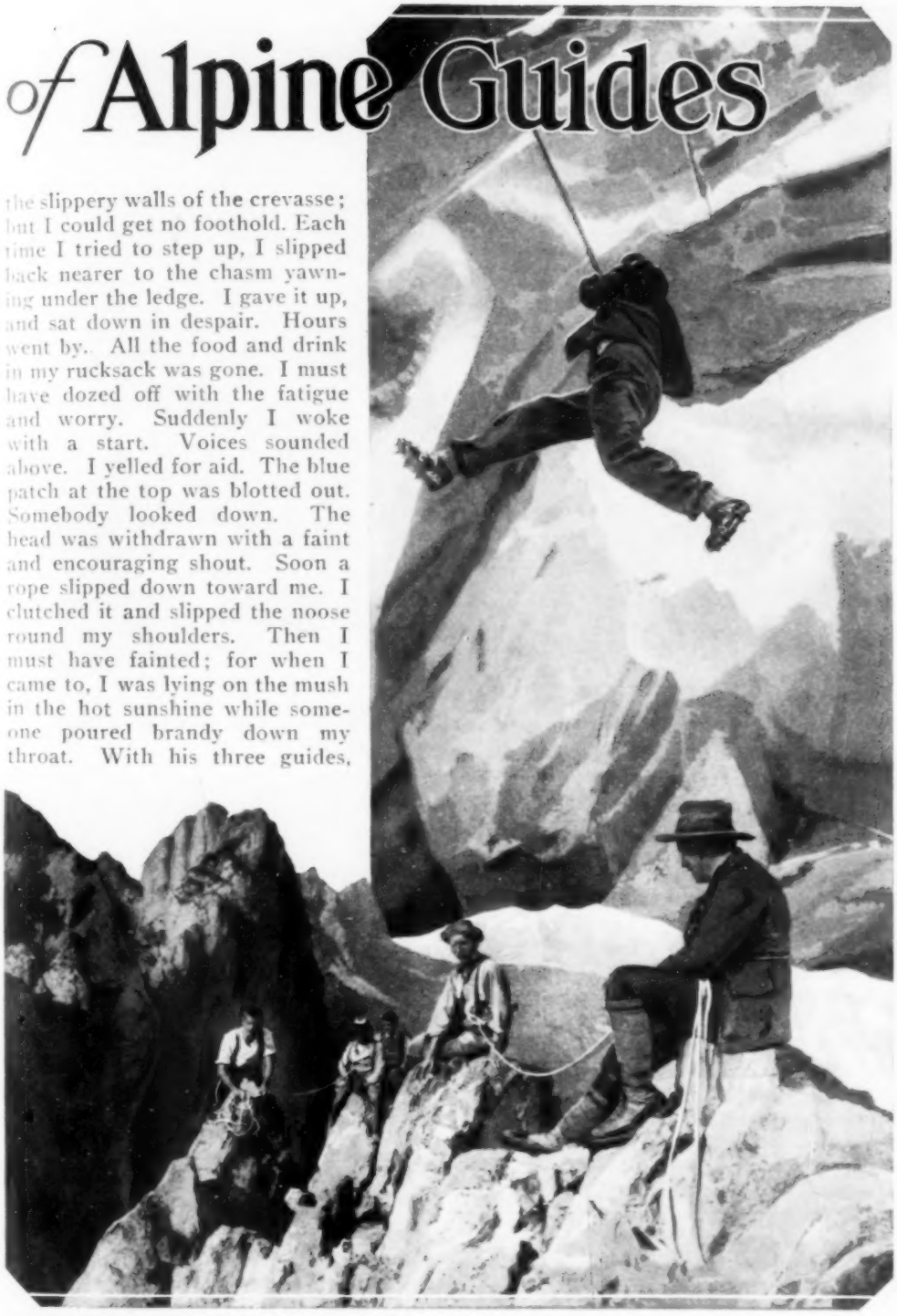
If the unfledged mountaineer shows he has not the "feel of the ice," and is likely to slip down to the edge of a dizzy precipice and imperil the lives of all, the guides hang on the taut rope, and carefully lift the amateur from one step to another, till he reaches safety on the sides of Schreckhorn or the icy Dent Blanche. The guide daily risks his life to give his party pleasure, or goes out of his way to save some climber in distress.

One famous guide recently told a story of a nightmare adventure he had when crossing alone a desolate and unfrequented glacier in the eastern Alps. He slipped and fell into a tremendous crevasse—an almost bottomless chasm in the ice. Luckily, a ledge caught him and broke his fall. When he recovered from the shock, he first congratulated himself on having no broken bones.

"I knew it was worse than useless to shout for help" he said. "Nobody ever passed that way; for it is out of the usual track of summer visitors who climb the passes above the snow line. It was as though I lay at the bottom of a shaft in a very deep mine. Far, very far above me, I dimly glimpsed a pen point of blue sky. In desperation, I set to, and cut steps with my ice ax in

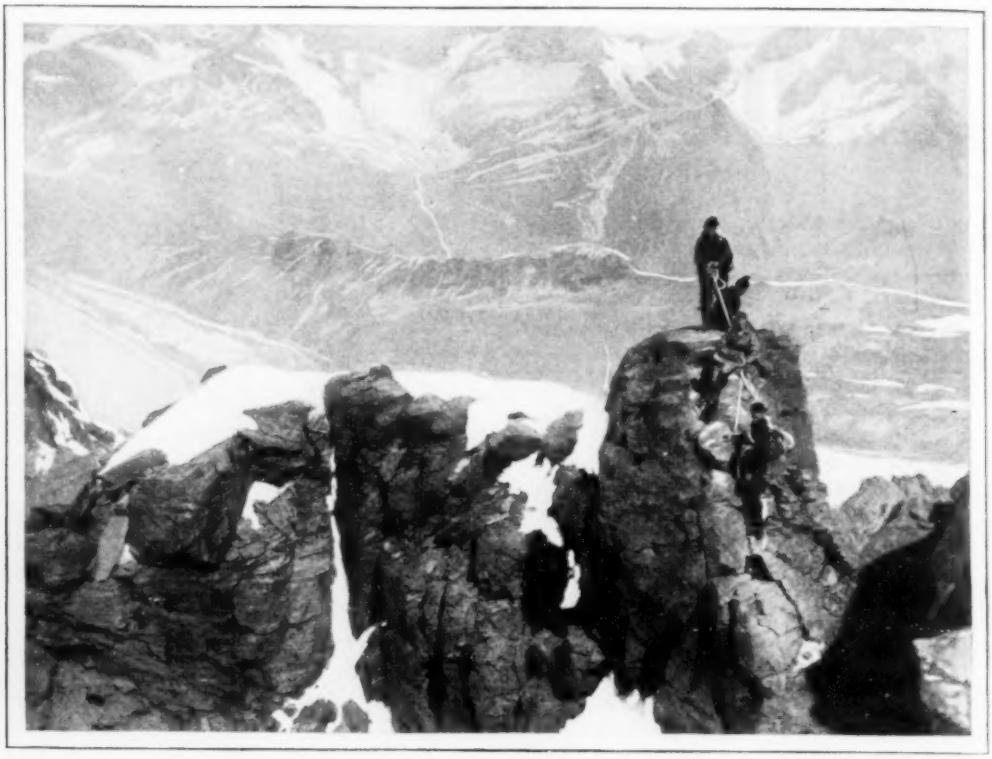
# of Alpine Guides

the slippery walls of the crevasse; but I could get no foothold. Each time I tried to step up, I slipped back nearer to the chasm yawning under the ledge. I gave it up, and sat down in despair. Hours went by. All the food and drink in my rucksack was gone. I must have dozed off with the fatigue and worry. Suddenly I woke with a start. Voices sounded above. I yelled for aid. The blue patch at the top was blotted out. Somebody looked down. The head was withdrawn with a faint and encouraging shout. Soon a rope slipped down toward me. I clutched it and slipped the noose round my shoulders. Then I must have fainted; for when I came to, I was lying on the mush in the hot sunshine while someone poured brandy down my throat. With his three guides,



Top Photo Courtesy J. H. Witham; Lower, Courtesy P. Dreyfuss

Above, Swiss Guide Exploring the Interior of a Crevasse in a Glacier to Find Bodies of Missing Climbers, and, Below, Alpine Party on Top of Crag in Gastlosen Range



Courtesy F. Rohr

Guides and Party Ascending a Peak in the Weisshorn Ridge of the Monte Rosa Alps; a Long Climb Is a Series of Separate Feats like This, Many of Them Hazardous

an English traveler, luckily for me, chanced to be crossing the lonely glacier, when one of the guides saw my alpenstock lying in a niche of the ice."

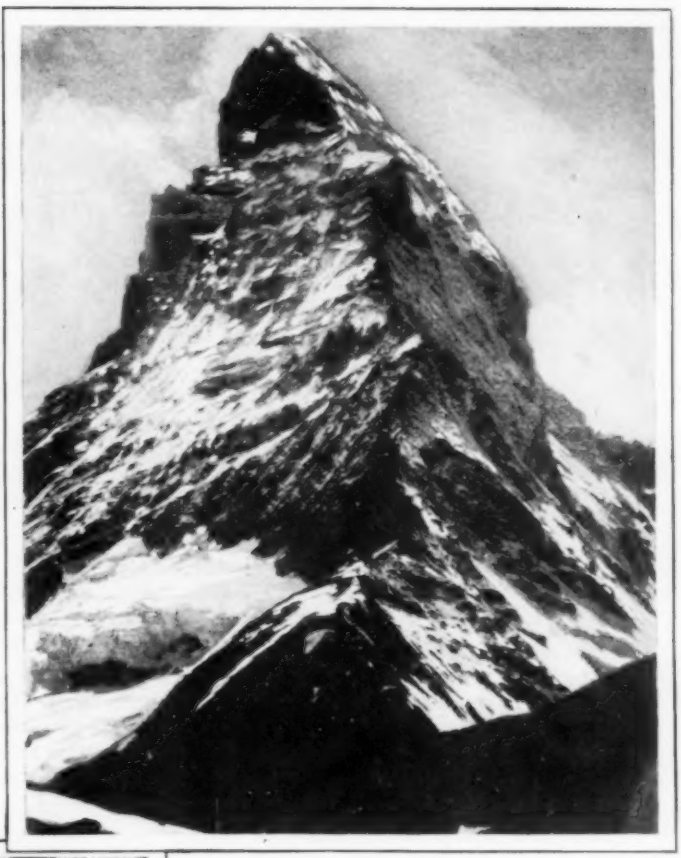
The Matterhorn's peak, 14,750 feet high, in the southern Alps, is famous for thrilling escapes and tragic happenings. The first English party to climb the Matterhorn were a well-known Alpine climber Edward Whymper, Lord Francis Douglas, a Mr. Hadow, Mr. Croz, Mr. Hudson, and two Swiss professional guides, father and son, named Taugwalder. Thousands of feet up, at the tail of the train, Hadow slipped on the ice and fell against Croz. Both men lost their balance, and dragged down Lord Douglas and Mr. Hudson. The taut rope snapped under the strain of the four bodies, leaving the guides and one Englishman safe at the head of the train. Hurtling through the frozen air for 4,000 feet, the bodies of the four climbers smashed onto the Zermatt glacier below.

Herr Biner, well-known today as a Zermatt chief guide, who, although only thirty-two years of age, has climbed the Matterhorn seventy times, speaks with a shudder of this tragic event which happened in the days of his father. He himself tells a story of a terrible adventure which befell him recently on another famous Swiss Alpine peak, the Dent Blanche.

"Along with an Englishman, I was caught in a howling blizzard on that peak, and for five or six hours, we battled on in the semidarkness. We stumbled on and struck a donkey-back ridge or col. Here, to save ourselves from hidden perils, we straddled the ridge like a horse's back. When the snow let up, we saw we were straddling a sort of tight-rope mount, on the tip of a precipice with a sheer drop on each side down to a glacier about 4,500 feet below! I started to hack out steps in the ice, but desisted when I found that every blow brought a dangerous shower of rock, stones and ice. To make matters worse, an electric storm broke, and for a

long time the flashes played round that ridge. The Englishman slipped and fell, and I was obliged to slip over on my side of the ridge, to balance his weight, and save him from a fall of 4,500 feet. When we got back into the saddle again, we wormed our way painfully along till we reached a rock flank, or neck. I pushed him under a rock, and lay above him to keep him warm. A snowstorm buried us but when morning light broke, we crawled out of our cave to the safety of a hut close to a near-by glacier."

Another Swiss guide tells how he was one day, recently, summoned to the aid of climbers in distress on Mont Blanc. "M. Thoret, the pilot of the Air Union, was taking people for flights over the highest peaks in Europe when he saw these climbers waving their handkerchiefs to him at the end of ice axes. He flew back to Chamonix airdrome, painted under his wings, "Don't move; help is on the way," returned to the peak where the climbers were marooned, flew low so that they could see him, and then rushed back and telephoned to us from the airdrome. We reached the two climbers, who were badly injured, and with great difficulty got them on our backs and carried them to the Torino hut, on the Col du Geant."



Courtesy Emile Gos

Above, the Matterhorn, the Waterloo of Many Climbers, and, Below, a Guide in a Mountain Hut

BEACON USED AS SCARECROW

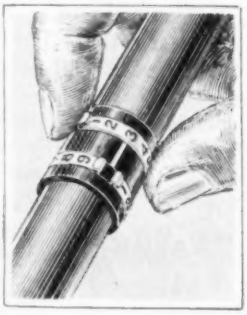
To protect rice fields in Arkansas from wild fowl, experiments have been made with an airplane beacon. The brilliant light is calculated to frighten wild geese and ducks over a radius of several miles. Both red and white rays have been tested.

Spectrograph Apparatus at Northern Lights Observatory at Tromso, Norway, Which Splits the Colors of the Northern Lights so That This Phenomenon Can Be Subjected to Study

NORTHERN LIGHT OBSERVATORY IS NEAREST THE POLE

To photograph and study the northern lights, an observatory has been constructed at Tromso, Norway, through contributions from the Rockefeller fund and the Norwegian government. It is the farthest north of any observatory and is equipped with a spectrograph which splits the colors of the northern lights so that they may be subjected to scientific study.

GOLF SCORER ON CLUB SHAFT SAVES USING CARD



Easily attached to the shaft of the putter, a scoring device, consisting of two numbered metal strips that are turned about in grooves, simplifies the task of keeping a record of the strokes. When the total score reaches a number of two digits, the second strip is brought into use. Both are alined with a white mark. The scorer does not interfere with play, is instantly adjusted and the numbers are not likely to become disarranged by accident, although they can be turned with little difficulty. The base of the scorer is of a flexible material and is split so that the unit can be slipped on the club shaft.

OXYGEN BUBBLES FROM PLANT FATAL TO MOSQUITOES

Oxygen, usually essential to life, is fatal to mosquitoes in the wiggler stage, it has been found at Cornell University. The discovery introduces a bottom-growing plant, called chara, which gives off minute bubbles of oxygen. In pools of water where chara was growing, no mosquito larvæ were found, while others that contained no chara were prolific breeding places. It was thought that the oxygen produced by the plant might be responsible, and to prove it, mosquito larvæ were placed in jars filled with water. Oxygen bubbles were admitted to some of the containers, while the others were left undisturbed. In a few days, the larvæ from the jars without oxygen emerged as mosquitoes, but all in the other jars had died.

¶Germany uses motor engines at small stations to expedite the rearrangement of freight trains.

ANIMAL TESTS TO GIVE FACTS FOR TRIPS IN ROCKETS

Experiments on animals in large and small gravitational fields have been suggested as a preparation for travel through space to other planets by Dr. John Q. Stewart, of Princeton University. Doctor Stewart suggested tests with animals or even men in a rotating cage where centripetal acceleration would simulate gravity. It has even been suggested, he added, that such a cylinder in a space ship might provide the passengers with an artificial gravitational field so the crew could work under normal conditions.

WOODEN RAILROADS IN FOREST GIVE ACCESS TO TIMBER

Wooden railroads, costing about one-tenth as much to build as a first-class highway, are being constructed into the forests of Oregon to give cheap access the year round to the lumber regions. These roads, with rails made entirely of wood, have been found to reduce the cost of transporting timber from $3 to 50 cents a thousand feet. Under the old system, lumber could be hauled over gravel roads only about three months out of a year, while under the new, it can be transported the year round. The construction of the road is extremely simple. The bed is prepared as for an ordinary dirt road, and the ties are placed directly on the ground.

Wooden Railroad Cheaper than a Good Highway Built into the Timber Regions of Oregon

Portable Oxygen Apparatus Particularly Suited for Parachute Jumps from High Altitudes

PORTABLE "LUNG" FOR FLYERS TO AID HIGH FLIGHTS

Weighing but fourteen pounds, a portable oxygen apparatus that has several improvements over the usual units of its kind, is said to function so efficiently that flights to altitudes of at least 40,000 feet can be made without undue hazard or difficulty. Because of the lightness of the outfit, it can also be employed by parachute jumpers from great heights.

GREASED MOUNTAINS FORMED LANDSCAPE OF OREGON

Lubricated mountains which have slid considerable distances to form a topography of great magnitude have been found by geologists in the John Day river area of interior Oregon. In one place great masses have moved toward the river, producing landslide pockets and lakes because the Columbia river lavas, hundreds of feet thick in places, poured over the John Day river clays, a formation easily softened by ground water. These clays then acted as a lubricant over which the heavy Columbia lava slid.

Jumping Balloon Whose Buoyancy Counterbalances Weight of Occupant, Allowing Him to Leap for Great Distances

OCCUPANT OF LEAPING BALLOON WALKS ON WATER

Probably the nearest approach to the seven-league boots of fairytale fame is offered by a jumping balloon, the invention of a California man. The balloon is so designed that its buoyancy can be made to counterbalance almost exactly the weight of the occupant, thus enabling him to walk, or more exactly, to jump, on water, with the aid of a staff, equipped with a buoyant ball, for propulsion.

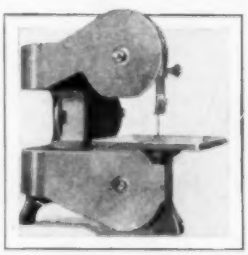
BLOODSTAINS ARE SEEN AS AID IN CRIME DETECTION

A German expert is working on a way by which bloodstains may be classified as an aid in crime detection. For instance, if the stains on the clothing of a suspect could be proved to be the same as the blood of the victim, the evidence would be considered important. Courts have recognized scientific tests to determine whether bloodstains were made by human blood or not, but so far, there has not been introduced a successful test which will accurately determine the blood group of stains that have become thoroughly dried. In certain European countries, it is now customary to determine the blood groups of persons concerned with crimes involving wounding, as such evidence is regarded as valuable even though stains cannot be positively identified.

AUTOISTS' DANGER AGE IS THE TWENTIES

Analysis of automobile accidents in California during the first six months of 1930 showed that drivers with two or more years' experience figured in the greatest number of accidents. More than 12,000 drivers figuring in over 14,000 accidents had two or more years of driving to their credit. The "dangerous age" for motorists appeared to be from twenty to twenty-nine years, with 5,296 drivers in accidents in this age class. Drivers from thirty to thirty-nine came next with those from forty to forty-nine following.

BANDSAW WITH FIVE WHEELS TAKES LONGER BLADE



Fitted with five wheels instead of the conventional two, a bandsaw is now offered with two advantages over the ordinary kind. It accommodates a much longer blade which will not dull so quickly, and a recess enables one to cut a wide board of great length squarely into two pieces.

THREE-DIMENSION MOVIES SEEN IN PROJECTION PROCESS

Successful stereoscopic motion pictures are still in the development stage, but a projection process recently demonstrated with still pictures suggests a way in which movies may achieve the full three dimensions in the future. Dr. Herbert E. Ives, of the Bell telephone laboratories, has explained the method which he and associates have developed. On the film are embossed narrow vertical ribs like those used on the amateur motion-picture color film. These ribs act as cylindrical lenses, directing the light, while the screen is made as a series of vertical glass rods and the picture is displayed from the back. Persons looking at it from the front obtain a true stereoscopic effect due to the action of the light from the film and through the glass screen. The method at present is not suited for motion pictures.

RADIO SET IN DELIVERY WAGON FOR CUSTOMERS' BENEFIT

For the benefit of his customers, the driver of a bakery wagon in Buffalo, N. Y., has equipped the horse-drawn vehicle with a radio-receiving set. When he solicits orders, he also supplies his customers with the latest news flashes.

Bakery Wagon Equipped with Radio so the Delivery Boy Can Tell Customers the Ball Score

Glass Window, Used Instead of Mesh Screen in Visitors' Room in Jail, to Stop Smuggling

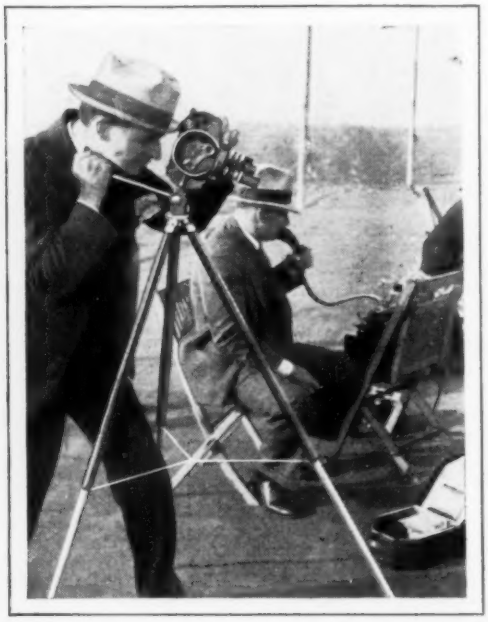
GLASS REPLACES JAIL BARS TO STOP SMUGGLING

Plate-glass windows instead of the usual steel screens are used in the new Pasadena, Calif., city jail in the visitors' room to separate the prisoners from those who come to see them. Conversation between the prisoners and visitors is carried on through perforations in the steel wall below the windows through which they gaze at each other. These perforations are so arranged, however, that not even a pin can be smuggled through from a friend to a prisoner. Smuggling to prisoners was one of the hazards always faced when the screens were used in the visitors' room.

FISH SCALER LIKE HAIR CLIPPER

Operated by a tiny electric motor, a machine that automatically removes the scales from fish has been invented by the head of a Florida fishing company. The scaler works somewhat like a hair clipper, slicing the scales from fish of any size as it comes in contact with them.

¶ Japan has sixteen floating canneries for handling of crab meat.



Courtesy Bell & Howell

Taking Movies of Football Formation While Coach Comments on Voice-Recording Machine

"TALKIES" OF FOOTBALL GAME HELP IN TRAINING

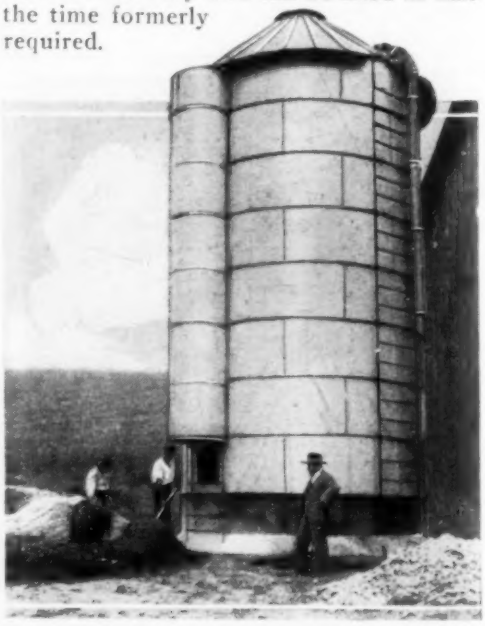
Athletic coaches have used motion pictures of football games for some time to analyze various formations and instruct the players, but this season, an advanced step was taken by L. W. St. John, athletic director of Ohio State University, who hit upon the idea of making a voice record as the movie was being filmed so that a more faithful description of the plays might be given. While the pictures were being taken, St. John dictated his comments, play by play, to a voice-recording machine commonly used in offices. A transcript of his story was then made in duplicate and read at the showing of the films, so that every player concerned could better understand the comments on his particular performance and the analysis of the plays. The cameras were run at a speed to make thirty-two exposures per second, semi-slow speed so that the movements could be studied more accurately. Movies are also being used to determine the best ways to teach runners and how they may improve their technique. In this case high-speed cameras were used and over 2,000 pictures studied.

OUTPUT OF AUTOS AND WAGONS REVERSED IN FEW YEARS

Automobiles and horse-drawn vehicles take reverse positions on the production scales after a period of twenty-five years. In 1904, nearly 2,000,000 horse-drawn vehicles with a value of more than $97,000,000 were manufactured, while only 199 automobiles were produced in this country. Last year, the total automobile output was 5,300,000 of an uncomputed value, while 122,734 horse-drawn vehicles, valued at $10,323,535, were produced. The number of two-wheeled carts, farm trucks and public conveyances drawn by horses increased during the last year, and one of the features of the industry is that there is an increasing demand for more expensive hand and push carts.

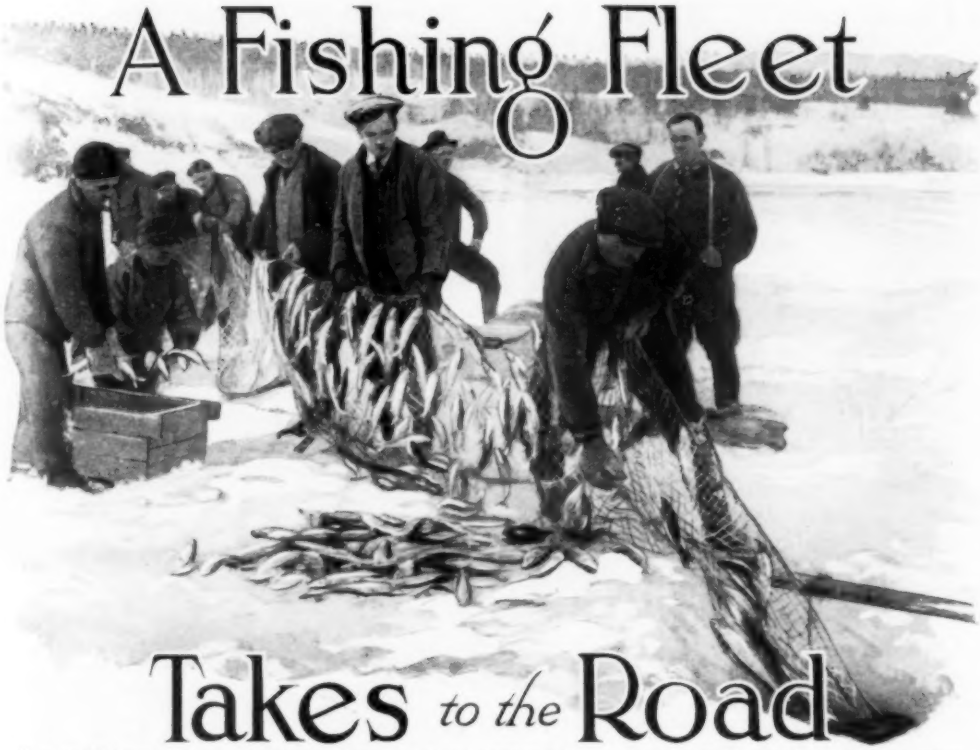
SILO LIKE A VACUUM CLEANER IS FILLED BY SUCTION

Operating on the same principle as a vacuum cleaner, a silo of galvanized iron, invented by a French engineer, is filled by suction. An electric or gasoline motor is connected with a tube which sucks the hay or other material to the top of the silo, then drops it inside. By this method a silo of ordinary size can be filled in half the time formerly required.



Galvanized-Iron Silo Filled by Suction, the Ensilage Being Drawn through a Pneumatic Tube

A Fishing Fleet Takes to the Road



Sunday Visitors Giving a Herring Fisherman Aid in Hauling a Large Catch through a Hole in the Ice; Huge Quantities of the Fish Are Caught during the Winter

IT WAS early in the morning when an automobile dashed up to the buildings of a wholesale fish dealer in Duluth, Minn. Obviously the man at the wheel was in a hurry as he leaped from the car and rushed into the office.

"I want two more gill nets and I want 'em quick," he shouted to the clerk. "Got to get 'em set before dark. The herrin' have started runnin' by my place. Send out fifteen extra fish boxes on the mornin' load. Give me floats and leads for the nets, too, and let me get goin'."

Ten minutes later the nets were stowed in the rear of the car and the fisherman was speeding back toward his place seventy-five miles up the north shore of Lake Superior. In less than three hours, he was in his sheds making the nets ready for the water. Before dark, he had taken them in his outboard motorboat to the banks nearly a mile off shore and set them. The next morning they started to give a return on his investment.

That incident is characteristic of the speed of the unique business that has developed on Lake Superior's north shore—probably the only completely motorized and the swiftest-moving fishing industry in the country, if not in the world.

A few years ago, that fisherman would have been lucky to get his nets within ten days. He would have had to wait for the fishing tug that called once a week for his shipments—salt fish in kegs during the summer and frozen fish in gunny sacks in the winter—given the skipper the order and got along with insufficient equipment until the return of the vessel.

But now things have changed. The first twenty-seven miles of his homeward journey is over a broad concrete road running from Duluth to Two Harbors. For all practical purposes it traverses the very back yards of the fishing folks, who put out from the land in their small boats to set their nets and bring in their catch. And that means that the new road is giving commercial service to nearly a thousand families who make their living from the waters.

So, now, instead of a weekly, slow serv-

Calf Moose, a Pet of One of the Fishermen's Families, and Tug Plowing through Canal at Duluth for Winter Anchorage

ice, the fishermen are able to get supplies and market their fish daily. For the sluggish fishing boats have given way to a fleet of more than forty swift automobile trucks that act as a mother fleet to the small craft of the fishers. They leave Duluth and Two Harbors loaded with supplies, boxes, kegs and ice, and are back in a few hours loaded with fish fresh from the icy waters of Superior.

Trout, whitefish and herring, taken from the lake in the morning, can be delivered in Duluth by noon, in St. Paul and Minneapolis that night, and in Chicago the next morning. A few hours after that they are in the markets of other large middle-west cities, virtually as fresh as when taken from the water.

But the motorizing of the north-shore fishing industry hasn't taken the thrill and adventure out of the business. The motor trucks of the rival wholesalers race for market with just as much at stake as when the fishing schooners race in from the Grand Banks of the Atlantic. And still, as always has been and, perhaps, always will be, the heart of the industry is the man in the small boat. And when men take to the tossing waters in little craft, they are bound to meet with high adventure.

There was the experience of Jans Everson and his wife. Jans fished from French river, about halfway between Duluth and Two Harbors. He awoke one morning in December to see scudding clouds flying before a northwester and a hint of snow in the air. He must pull his nets quickly to land the night's catch. Even with the aid of his outboard motor, he knew that one man could not hope to handle a boat in that blow, and his partner was away. His wife volunteered to go with him. Hardly had they reached the net buoy, when the wind rose higher and the blizzard closed in about them. They abandoned their efforts to lift the net and started back. Their motor started, then coughed and stopped, nor could they get it going again. Each put out a pair of oars and tried to row in, but their strength gave out before they could cover the mile of wild water between the buoy and the shore.

They had to give up and let the craft fly before the storm. When, a few hours later, they brought up against a heaving ice pack on the south shore of the lake—twenty miles wide at this point—the wife was overcome by the cold and unconscious, and feeling had almost left Everson's hands and feet. By this time the temperature was down nearly to the zero mark. Summoning all his remaining strength, he forced the boat through the ice cakes and finally made the strip of firm ice along the beach, already beginning

to crack from the force of the waves. The struggle across the ice to the shore must have been a terrible ordeal, but Everson remembers little about it. A few hours later, a woodcutter, returning to his shack, found them lying in the snow, the fisherman's unconscious form across that of his wife, where he had fallen when the last of his strength ebbed away. It was several days before they could be gotten to a physician, but both lived to return to their north-shore home.

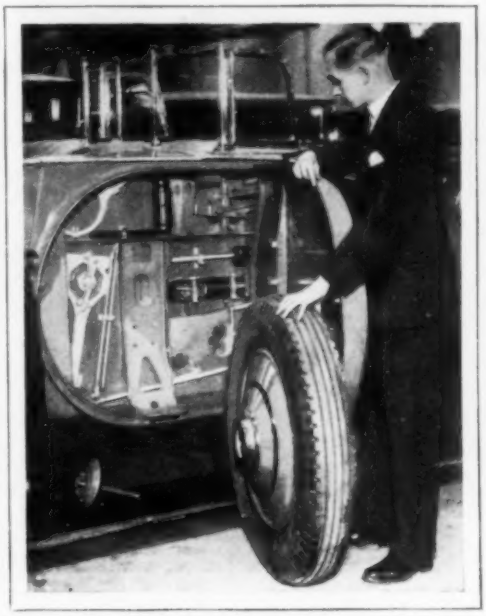
Fast transportation has added a new item to the harvest from the waters—iced fresh fish. Seldom a week, from the middle of March until late in December, that the fishermen of the north shore do not send out from 1,500 to 2,000 boxes of fresh fish, each box containing 100 pounds. Modern refrigeration makes it possible to ship the catch in perfect condition as far east as Pittsburgh, west to Denver and south to St. Louis and Kansas City.

BLOCKS USED INSTEAD OF LOGS TO CONSTRUCT CABIN

Logs have been sawed into eighteen-inch lengths instead of being used as entire units in the construction of an attractive cabin. The blocks are firmly set into mortar and form an interesting design somewhat resembling that produced by the use of uncut stone.

Blocks Sawed from Logs and Set into Mortar Form the Walls of This Attractive Cabin

BUILT-IN TOOL CHEST FOR AUTO FITS BEHIND TIRE RACK



Tool Chest Built into Body of Auto; the Spare-Tire Rack over It Makes It Invisible

Containing virtually every tool that might be required to repair any part of the car, an automobile recently exhibited in London has a tool chest built into the body. The tools fit into receptacles in a recess behind the spare-tire rack. When the rack is in place, the receptacle is entirely concealed, but when the spare is removed, a complete set of equipment for repairs is available in handy form.

PHOTOGRAPH LIKE BAS-RELIEF GIVES LIFELIKE EFFECT

Some of the beauties of sculpture are being applied to photography by a special process which gives the illusion of a third dimension to a picture, causing the hair, features and form to stand out in bas-relief. Such photographs, in which the dimension of depth appears to be added, are called "sculptographs" and can be made from ordinary pictures, or even from snapshots.

¶Totem poles of the American Indians were monuments to their dead, and were not their idols.

Gun That Fires Tear-Gas Bomb, and One of Cartridges Used to Dislodge Barricaded Fugitive

TEAR-GAS GUN USED BY POLICE TO CAPTURE FUGITIVES

Guns that fire tear-gas bombs have been made a part of the equipment of the Los Angeles police. The weapons can be used to disperse rioters, but are intended particularly for dislodging fugitives who may barricade themselves in a building and threaten the lives of assaulting officers.

MAN-EATING TREE ONLY MYTH INVESTIGATORS FIND

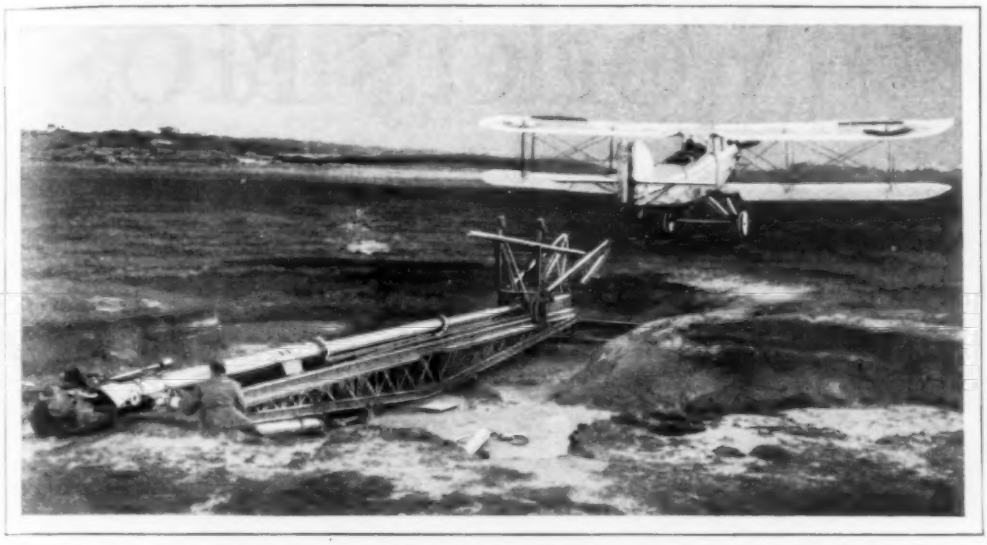
Stories of a man-eating tree in Madagascar which obtains its nourishment by capturing and devouring human beings have been found by investigators to be without foundation in fact. The tales of man-eating trees are based on a letter written in 1878 by a traveler in Madagascar, who said a native tribe on the island worshiped a devil tree whose trunk was eight feet tall and resembled a thick pineapple standing on end. Huge leaves hung from the trunk like doors swung back on their hinges, and at the apex was a receptacle filled with an intoxicating fluid. Long hairy tendrils stretched out from the receptacle, and swirled and twisted upward in constant motion. The traveler said he saw the natives compel a woman to mount the cone and drink of the liquid, after which the tendrils seized and held her fast as the doorlike leaves closed and crushed her. Members of the Marshall Field anthropological expedition investigated the story, and while the tale of the tree was widely circulated, its location was never specified and no basis was found for a belief that such a plant ever existed. However, there are certain tropical trees that are very poisonous, and plants, such as the pitcher plant, entrap and consume insects, while in London there is exhibited a plant from India which consumes exceptionally large insects and even mice.

QUEER CLOCK TELLS THE TIME BY CHANGING SPOTS

A dog that tells the right time was exhibited in New York recently. It is a mechanical affair so arranged that white spots register what the hands on an ordinary clock reveal. The spot on the left indicates the hour and those on the right, the minutes. At the time the accompanying photograph was taken, the time was fifty-three minutes after one o'clock.

Clock Shaped Like a Dog, Which Registers Time by the Changing White Spots in the Eyes

GROUND CATAPULT GIVES AIRPLANE FLYING START



Airplane Being Launched into the Air at Flying Speed from a Ground Catapult; with This Apparatus, the Ship Needs No Long Runway to Gather Speed before a Take-Off

Experiments with various types of airplane catapults are being conducted in England by the British royal air forces. One such device that has been tested consists of a metal framework from which the planes are launched into the air at flying speed. With this apparatus a ship is able to leave the ground without a long runway and can be launched in a region from which a take-off otherwise would be impossible.

PILOTLESS TUGBOAT IS RUN BY REMOTE CONTROL

Guided by remote control from the bridge of a boat in tow, an electric tugboat is being operated on the St. Lawrence river to tow car floats. An electric connection is made between the car float and the tugboat, and the pilot controls steering and all operations of the machinery on the tug from the float. The remote-control system was necessary because the tugboat is so small compared with the float, that a pilot on the tugboat was unable to see well enough to control the movements of both craft. The steel tug boat is 120 feet long and propelled by Diesel-electric drive. The steel float has a capacity of twenty-three cars. Three operating stations are provided for control of the propulsion machinery, one in the engine room of the tugboat, one in the pilothouse, and the third on the bridge of the car float.

SAFETY DOOR LOCK ALSO ACTS AS BOTTLE OPENER

Easily adjusted, a steel guard for the door lock fits on the inside of any hinged door to prevent its opening from the outside. It consists of two flat pieces held together by a short chain. One slips into the lock socket of the door and the other is fitted into any one of three slots provided. This part of the guard can also be used as a bottle opener. The device can be carried in the pocket or traveling bag and is always ready for use. No bolts or screws are needed.

¶Write our Bureau of Information, if you wish to know who makes or sells any article described in this magazine. Send no postage; the service is free.

The World's Most

One of the Finest and Largest Yachts Afloat, J. P. Morgan's "Corsair"; It Cost Approximately $3,000,000 and Is Luxuriously Equipped in Every Detail

FIVE THOUSAND North American yachtsmen went down to the sea in their own ships last year, carrying the emblems of 750 yacht clubs to every maritime nation on the globe. The princely sport of yachting adjusts itself to the most fabulous fortune.

There are half a dozen private yachts whose annual upkeep exceeds $300,000. J. P. Morgan's 343-foot "Corsair" probably will have cost her owner a cool half million by her first birthday, March, 1931; her original cost was about $3,000,000.

That sea yachting is now becoming a major American industry is shown by the fact that about 100,000 people are directly concerned with it. In five years, yachts in American waters have increased 150 per cent. And during 1930, when the country stagnated under financial depression, yacht building doubled. A single company was filling $19,000,000 worth of orders as against $1,000,000 a few years previously.

These figures shake the faith of pessimists. The American is not content merely to earn money; he seeks ways of spending, too. And he is not content with being a landlubber; he craves sea adventure, but comfortable adventure. And so Yankee palaces are cruising to the ends of the earth, supplied with victuals and luxuries that were formerly the attributes only of monarchs.

About the strange whims of yachtsmen, stories are legion. But the most famous one concerns Henry Ford. His 202-foot yacht, the "Sialia," was too short; he wanted twenty-one feet added. So he summoned an architect and gave instructions. The "Sialia" was literally sawed in half, and a new section placed into her beam. Well satisfied with twenty-one

Costly Sport

more feet of sea room, Mr. Ford paid $650,000 for the operation, which was $50,000 more than the "Sialia's" original cost. The new section cost about $30,000 per foot. Soon Mr. Ford tired of the "Sialia" and placed her on the market, but yachtsmen were wary, fearing she was not seaworthy. At length, she was sold.

Used yachts are sold for from $50,000 up to $2,000,000. The broker's commission is seven per cent. In the long run, this is the most economical way to buy a floating home, for with proper care a yacht will last many years, allowance for replacement of movable parts, of course, being made. Astute sportsmen pick up some real bargains through brokers. Thus, A. M. Andrews bought Henry Ford's $1,250,000 yacht for one-fifth that price.

Courtesy Henry J. Gielow, Inc.

"Migrant," a 225-Foot Schooner, and Bronze Figurehead of the "Hi-Esmaro"

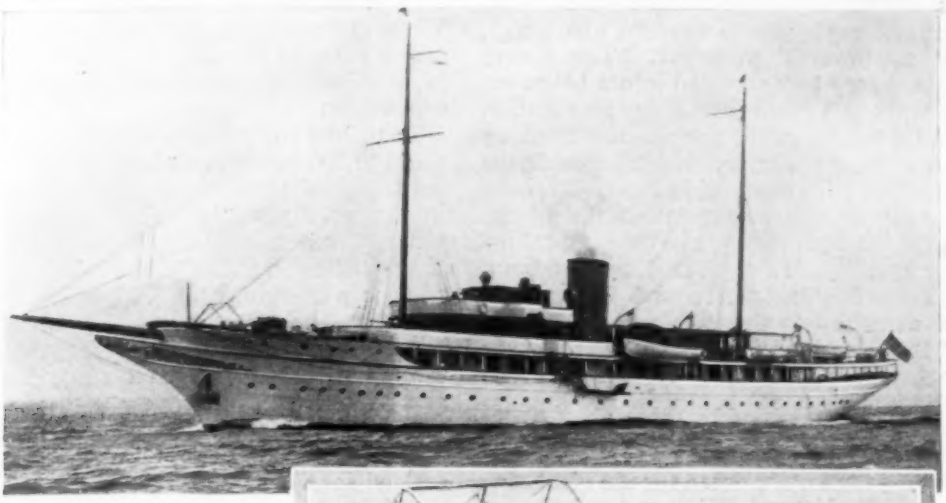
A recent improvement in power yachting has been the change from steam to Diesel propulsion. For yachts below 200 feet, this change has brought so many advantages that no one would think of building a steam yacht that size any more. High-speed Diesels actually have increased a yacht's cruising range six times. Formerly 1,000 miles was considered a high range, but modern Diesel yachts cruise easily 6,000 miles. And the largest motor-driven pleasure boat ever built in

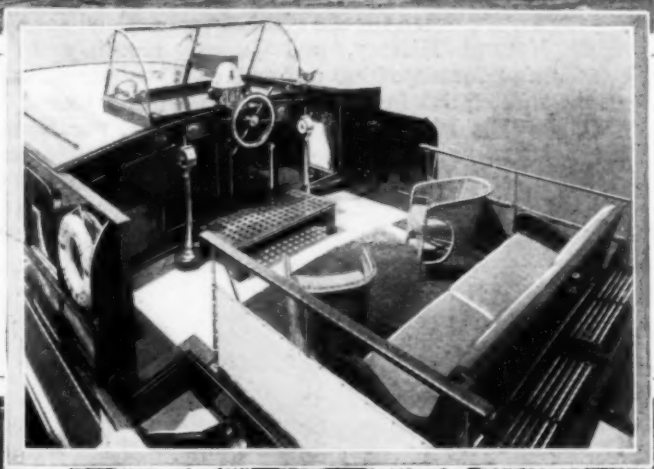
Interesting Views of Two Launchings; Above, the "Placida" and, Below, Carl Tucker's "Migrant"

the United States, "Hi-Esmaro," can almost travel around the globe without refueling. Her cruising range is 20,000 miles. With a reduction in size and weight, the Diesel engine makes it possible to increase a yacht's accommodations without lengthening her hull. Thus the 120-foot Diesel yacht offers as much usable space as the old 150-foot steam yacht. For a yacht as large as J. P. Morgan's "Corsair," a turbo-electric drive has been found most efficient.

Until recent years, the hull design in power yachts followed the design of sailboats. But with new power plants, architects can design fuller hull forms without sacrificing speed or efficiency. This means greater fuel-carrying capacity and steadiness in rough seas. An ultra-modern yacht employs gyroscopes for automatic steering. In foggy weather, her captain relies on a radio direction finder. Her cruising speed is about fourteen knots and high speed between fifteen and sixteen knots. Save in storms, she does not have to slow down to plow through heavy seas. Her stabilizers reduce roll and vibration.

Communication between different parts of the ship is by telephone. An automatic elevator carries passengers between decks. Electric refrigeration plants preserve foods at desired temperatures. Every part of the vessel can be ventilated, heated, chilled and lighted. The main deck may have a tennis court. The ship has a laundry for milady's finest lingerie, as well as for table linens and ordinary wearing apparel. Bathrooms are lined with tile. Staterooms, corridors and public rooms are expensively carpeted. Wall finishings may be fine stone, stucco plaster, mahogany, sandalwood, teak or oak. The main





Another View of the "Hi-Esmaro," Motor-Driven Yacht with Long Cruising Range, Owned by H. Edward Manville, at Right, View on Board the "Frolic III," Express Cruiser Owned by Walter P. Chrysler, and, Below, the Luxurious Smoking Room of the "Cambriona," the Property of W. O. Briggs of Detroit; the "Frolic III" Has a Speed of More than Twenty-Eight Miles an Hour and Is Seventy-Five Feet Long

Lower Photos Courtesy John H. Wells, Inc.

saloon has a wood-burning fireplace. Entertainment is offered by radio, pipe organ, or a stewards' orchestra. The dining saloon may be converted into a ballroom. The ship carries her own evaporation and filtration plant for making drinking water from sea brine. Her wireless keeps in touch with the world's news.

Aside from mere recreation, the private yacht has been found to be the ideal refuge for business. In quiet and freedom from disturbance, commerce and finance can be discussed to the exclusion of all else.

More wealthy yachtsmen are pursuing exploring expeditions. Recently, W. K. Vanderbilt's "Ara" returned with a cargo of zoological trophies collected on a world cruise. Cornelia Crane's "Illyria" is exploring the Pacific ocean for the Field Museum of Natural History, and Julius Fleischmann's "Camargo" has undertaken to find the missing link in anthropology.

The Galapagos islands, off the South American coast, have been the haven of yacht explorers. Vincent Astor visited the islands with a staff of scientists in his "Nourmahal."

Eldridge Johnson, former president of Victor Phonograph company, will soon take a party of scientists to Easter island in a 265-foot yacht especially built for exploration.

To build a yacht below eighty feet costs about $1,000 per foot. Above eighty feet, the cost runs up to about $4,000 per foot. But seaworthy eighty-foot yachts can be picked from a broker's list for about $50,000. Such a yacht would carry a crew of five: a captain, paid $250 per month; engineer, $175; two sailors at $85, and a mess boy at $80. Uniforms for the crew would cost about $625 per season; insurance about $1,500 per year, and winter storage about $900. Fitting out, drydocking and such charges would total $1,500.

Food for the crew would cost $225 per month, and food for the owners $3.50 per day per person. Two 100-horsepower engines would burn twenty-five gallons of fuel per hour. The season's lubricating oil would cost $100, and all other incidentals $500. Thus the season's operating budget would about equal that of a fine residence on land.

Scene before the Launching of the Spacious "Corsair" under Construction at Bath, Me.; in Addition to the High Original Cost of a Boat like This, the Maintenance Is Stupendous

FIRST OIL-ELECTRIC RAIL CAR ATTAINS HIGH SPEED

Oil-Electric Railway Car Which Operates under Its Own Power Supplied by Motors and Generators in Forward Compartment; It Can Travel at Eighty-Five Miles an Hour

At Youngstown, Ohio, the first "twin-six" oil-electric railway car was placed in service recently, operating under its own power from energy supplied by motors and generators in the forward compartment. The car attains a maximum speed of eighty-five miles an hour and has a cruising speed of seventy miles an hour. It is seventy-five feet long.

TIME TOLD BY BIRDS' SONGS IN MORNING HOURS

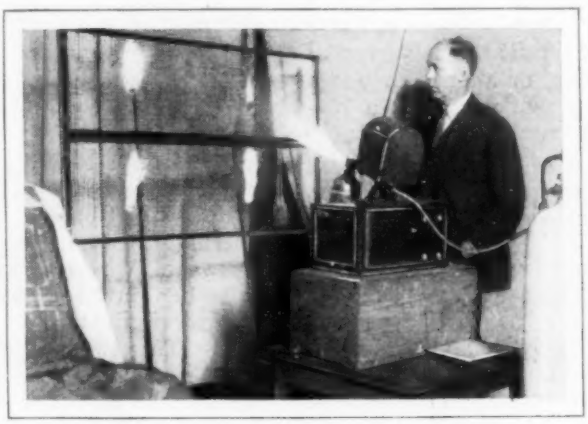
By studying and identifying the different bird calls, a German naturalist is able to tell the approximate time during the early morning. He has found that the chaffinch sings at about half past one o'clock on summer mornings, and the blackcap calls an hour later with a song like that of the nightingale but shorter. Between half past two and three o'clock, the quail call, while the hedge sparrows are heard about half an hour later. The blackbirds are next, followed by larks, the black-headed titmouse and, finally, the ordinary sparrows start between five and five thirty.

REFUSE FROM CANNING PLANTS USED FOR FERTILIZER

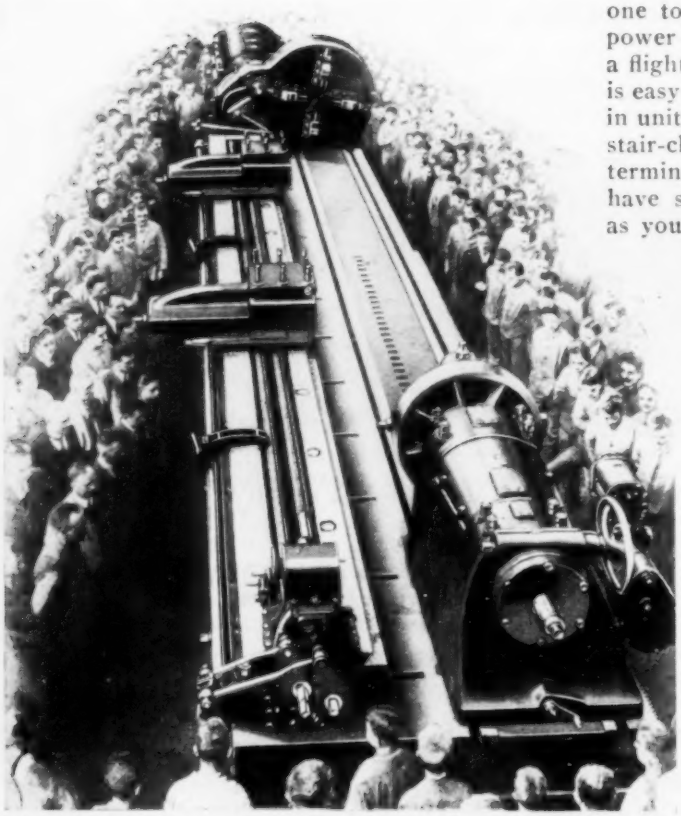
Rich in nitrogen, a fertilizer is being made from the refuse of citrus-fruit canning plants in Florida. The skins, seeds and waste pulp are utilized as well as some of the whole fruit not suitable for canning.

FIRE-FINDING ELECTRIC "FLEA" EXTINGUISHES BLAZE

Electrons, the smallest particles of matter known to science, have been put to work as fire fighters. L. W. Chubb, director of research of the Westinghouse laboratories, recently demonstrated this fire-finding electrical "flea." The device not only locates the source of a fire but also turns on an extinguisher which puts out the blaze.



Electron Fire Scanner Which Utilizes Smallest Particles of Matter to Find Blaze and Turn on Extinguisher



Giant Turning Lathe in Use in Germany: It Is More Than Thirty Feet Long and Is Operated by a 100-Horsepower Motor

BIG TURNING LATHE OPERATED BY POWERFUL MOTOR

One of the largest mechanical units of its kind has been built in Westphalia, Germany, where a huge turning lathe recently was placed in operation. Its over-all length is ten meters, or about thirty-two feet, and its heavy work requires a 100-horsepower for the running.

WHAT HORSEPOWER HAVE YOU? TOLD BY EASY TEST

How many horsepower have you? Interesting tests made at the Boeing school of aeronautics reduce the effort expended by human beings into the familiar terms of horsepower, and, incidentally, show the remarkable efficiency of a gasoline engine as compared with the body as a power plant. The human range is generally from one to one and one-half horsepower in such a task as climbing a flight of stairs at top speed. It is easy to calculate human energy in units of horsepower, using the stair-climbing test as a basis. Determine your accurate weight, have someone time you exactly as you dash up the stairs at full speed, and measure the exact height of the stairs. Now divide the time, in seconds, into sixty, multiply the result by the height of travel and this product by your weight, then divide the result by 33,000. This gives the horsepower, as one horsepower is equivalent to raising 33,000 pounds one foot in one minute. The Boeing student with the highest rating was able to carry his own weight of 175 pounds up a fourteen-foot ladder in three seconds. This represents about one and one-half horsepower. Some internal-combustion engines deliver more than one horsepower for each pound of weight. If a human being were equally efficient, he would be able to climb at a speed of more than 300 miles an hour.

SILENCER FOR OPEN WINDOWS KEEPS OUT NOISES

Giving free access to fresh air, but keeping out street noises, a silencer for open windows is the invention of Hiram P. Maxim, known for other inventions to eliminate noise. The silencer muffles the sound waves, and the anti-noise device is expected to be particularly useful in hospitals and in business offices in districts where traffic is heavy.

NEW RUBBER PLANTS ARE DISCOVERED IN RUSSIA

Tires Manufactured of Rubber Derived from Plants Cultivated by Soviets

Spraying Plants Which Are Being Raised in Russia for Use in Rubber-Making Experiments; the Soviets Plan Great Development of Their Rubber Cultivations and Manufacture

Above, Laboratory Workers at Kiev, Testing Substance Extracted from Plants to Determine Its Rubber-Making Possibilities, and, at Right, Examining Roots of One of the Rubber-Producing Plants; Millions of Acres Have Been Planted with This and Other Varieties, While Still Larger Cultivations, under Irrigation, Are Contemplated

Above, Showing Flexibility of Non-Cutting Glass; Below, Flaky Fragments of a Broken Piece

NON-CUTTING FLEXIBLE GLASS PREVENTS ACCIDENTS

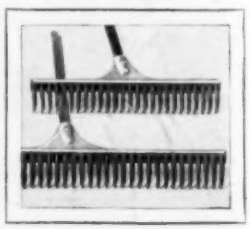
French railways and bus lines are experimenting with a flexible glass that does not cut when broken into pieces, with a view to adopting it for the windows of both railroad cars and busses. This flexible, non-cutting glass, called "securit," does not contain any wire reinforcement, and is unlike any other glass previously made, including the so-called shatterproof glass in use in this country. The product is not made like ordinary glass, the principle involved being analogous to that employed in producing metals with a combination of hardness and flexibility. Upon being broken, the glass crushes into thousands of tiny pieces, something like gravel, that may be handled without fear of injury from cuts. It will bend considerably before breaking, and a small pane of it will support the weight of two men, due to its flexibility. A piece may be held in the hand and broken with a hammer without injury from the flying particles.

MYSTERIOUS CIRCLE OF STONES CLUE TO INDIAN RITES

Resembling the famous Stonehenge of England, a series of circles of large sandstone slabs, set high on a cliff overlooking the Apishapa river in Colorado, indicates that the ancient Indians who inhabited the district may have practiced a form of sun worship. The stones, at first believed to have been a fort, have been studied by Prof. E. B. Renaud, of the University of Denver, who reports that they could never have been used for fortifications nor for marking off wigwams. Their size and arrangement show that they doubtless were used in connection with mystic rites, he declares. A slab fence, with an opening at one end, surrounds them, and at another circle site, there is an upright stone post in the center of each circle. This is the first find of stone circles in this part of the southwest, so far as can be determined.

RUBBER-PRONGED LAWN RAKE DOES NOT TEAR GRASS

Lawn rakes with rubber teeth, instead of metal, now are being offered as having several advantages over the ordinary rake, both from a safety and utilitarian standpoint. The prongs, made of rubber like that used in automobile tires, resist wear, stay elastic, stand all kinds of distortion, and do not clog, break or rust. The teeth are fastened into a metal yoke, and when turned up while lying on the ground, can be stepped on without injury, and the handle will not fly up. The flexible teeth adjust themselves to irregular ground and sweep clean without tearing or uprooting the grass. They have a springy action that helps kick the leaves with each stroke, and are tough and wear-resisting, so the rake can be used freely on gravel, brick, concrete or dirt walks. One of the rakes, weighted down, was dragged behind an automobile for twenty miles over all kinds of roads, as a test of its endurance, without damage to the teeth.

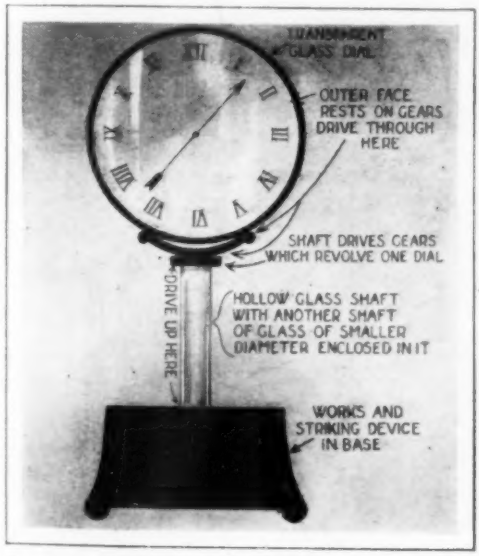


MODEL PLANE FLUTTERS WINGS AND FLIES STRAIGHT UP

Weighing only eight pounds and operated by a small electric motor, a model airplane, devised by a Chicago inventor, is said to be capable of vertical flight. Its wings are so adjusted that, as a rod to which they are fastened whirls, they flap like those of a bird, beating the air and folding up again a great many times a minute. Whether the idea can be adapted to useful sizes of planes, however, is an unsettled question.

SECRET OF "MYSTERY" CLOCK LIES IN GLASS SHAFT

One of the treasures of the Franklin Institute is a clock with concealed works. It is one of the many forms of mystery clocks and was presented to Benjamin Franklin in France in 1770. There is but one hand, the hour hand; the dial is transparent, and the only connection to the base is a glass support, but the clock runs and strikes the hours. The mechanism is concealed in the base and operates the hand through a shaft which is concealed in a separate hollow glass tube inside the main glass support. This inner unit cannot be seen; hence the operation of the clock is somewhat of a mystery to the spectator.


TRANSPARENT GLASS DIAL
OUTER FACE RESTS ON GEARS DRIVE THROUGH HERE
SHAFT DRIVES GEARS WHICH REVOLVE ONE DIAL
DRIVE UP HERE
HOLLOW GLASS SHAFT WITH ANOTHER SHAFT OF GLASS OF SMALLER DIAMETER ENCLOSED IN IT
WORKS AND STRIKING DEVICE IN BASE

Revealing the Secret of the "Mystery" Clock; Diagram Showing Chief Parts of the Instrument

Card Shuffler Which Mixes the Pack and Deals Four Hands of Bridge in Twenty Seconds

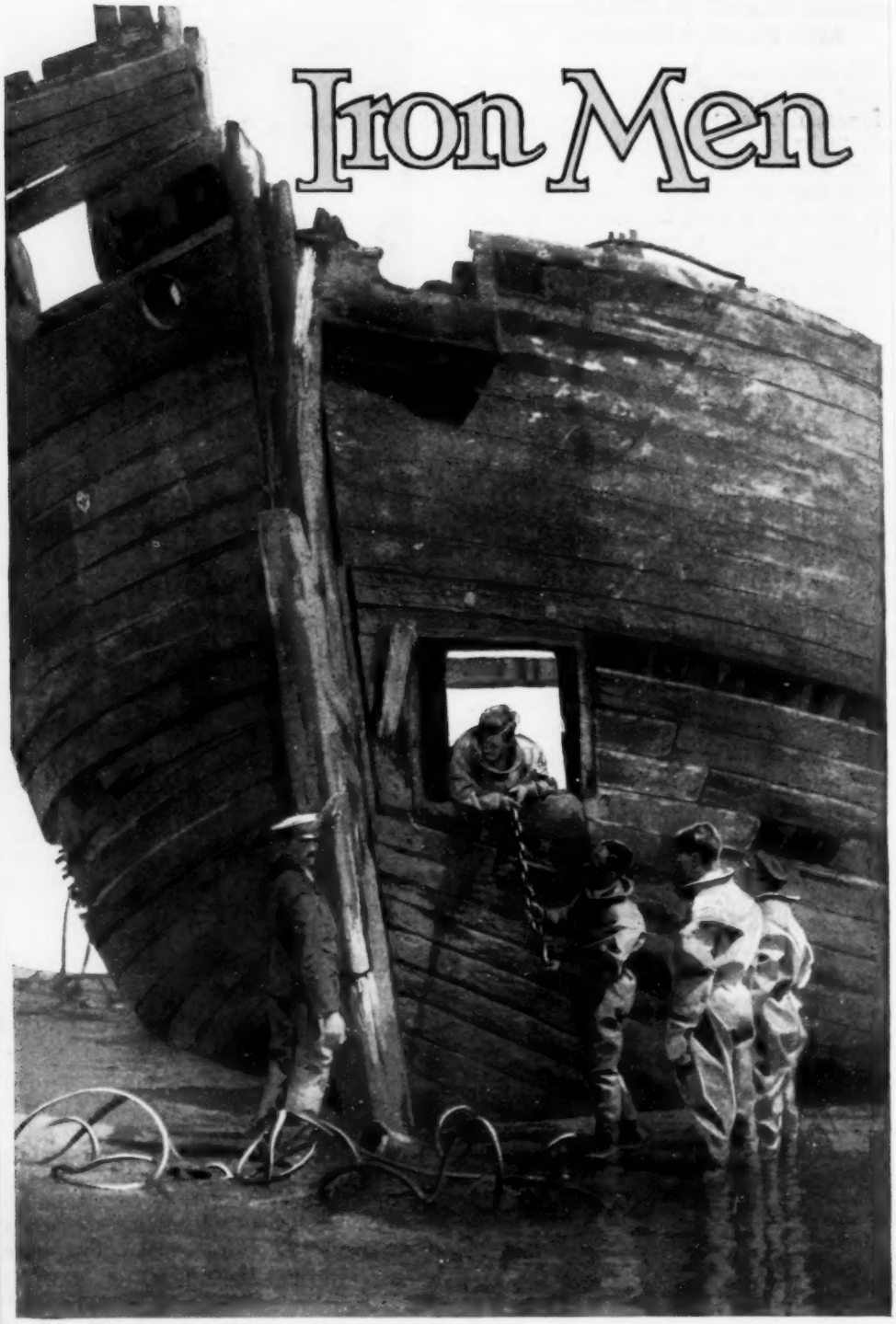
BRIDGE CARD SHUFFLER DEALS PACK IN FEW SECONDS

Shuffling a pack of cards and dealing four hands of bridge in twenty seconds is the task performed by a little machine that takes the work out of card playing. Seven seconds are required to deal in this manner, and the shuffling is accomplished by simply repeating the process. The device weighs less than a pound, and the inventor estimates that it saves more than half an hour in one evening of bridge.

DURALUMIN WEAKENED BY FIRE WHICH CHARS PAINT

Tests made to determine the effect of fire on duralumin airplane-wing beams reveal that the strength of the beams may be seriously impaired by fire which chars the paint covering the metal. Where the paint is only blackened, the weakening may be slight enough to permit keeping the metal in service. A test on tubular-steel fuselage members, obtained from a plane from which the fabric had been burned, indicated that the annealing effect of the heat improved the strength of the fuselage. In all cases where the paint is badly charred, however, insurance experts recommend that duralumin be replaced.

Iron Men



The Stranded Hull of a Wrecked Vessel Is Turned into a Schoolroom for Giving Practical Lessons in the Difficult and Dangerous Work of Salvage

Photos © Weltrundschau

under the Sea

WITH the depths at which divers can work safely being constantly increased, a unique school has been opened at Hamburg, Germany, to train men for this hazardous profession.

One hundred feet deep in the sea, the light is like that of a moonlight night; at 200 feet, like a starlight, while at 300 feet, divers say, it is too dark to see one's hands. Fish carrying their own lamps live a mile or more deep where the pressure of the water is equal to twenty or thirty thousand pounds to the square inch.

Mankind lives at the bottom of a sea of air, which presses on every square inch of the surface of our bodies with a weight of about fifteen pounds. This is at sea level and, as the pressure is evenly distributed, it makes no difference to us. But the pressure of air must be equal on all parts, otherwise things will happen.

With mouth and nose shut and lungs full of air, the naked diver goes down sixty feet or more, where the pressure on his body is thrice that of the atmosphere, but equally distributed. He stays a brief time to gather shell or sponge, then signals and is pulled to the top by a rope before the air in his lungs is used up. By deep breathing for a minute or two to wash carbonic acid out of his body, and by filling his lungs with oxygen, a naked diver can stay down four or even five minutes.

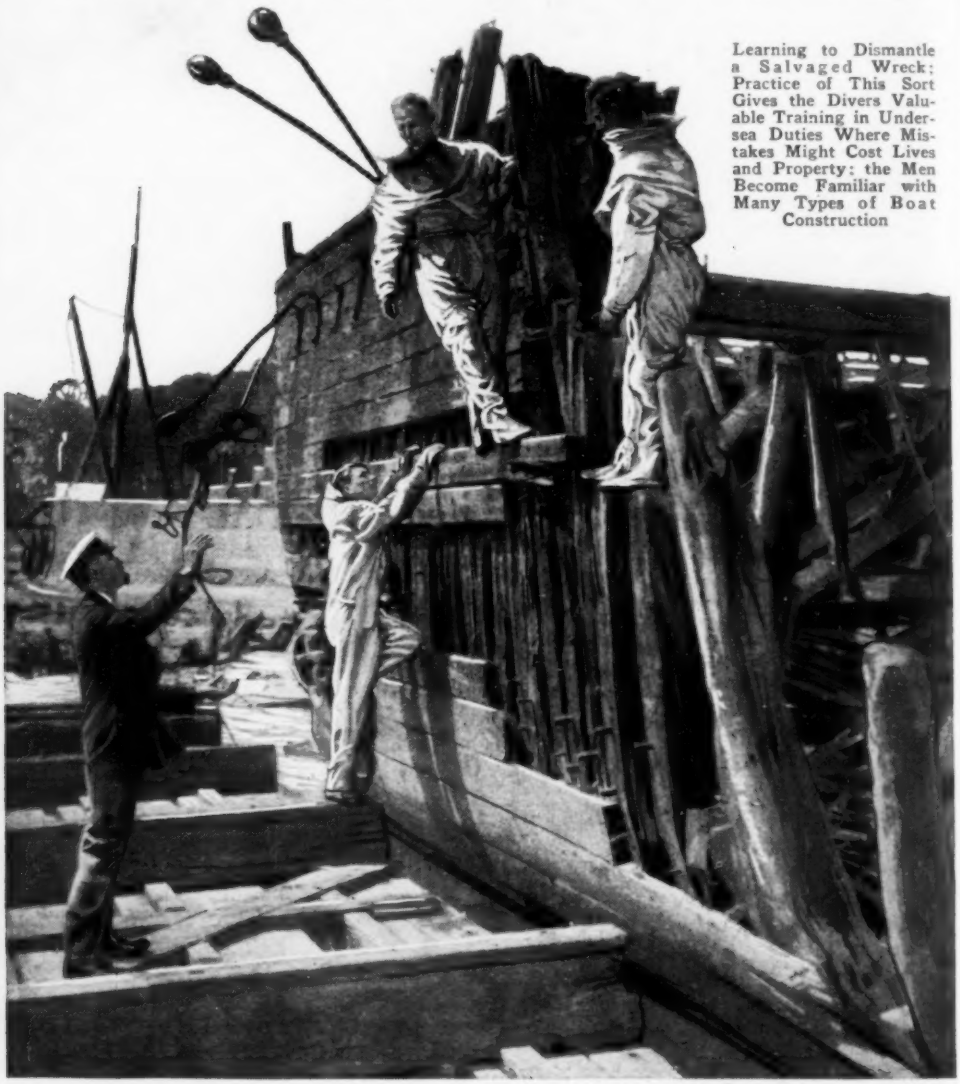
The diver fitted with helmet and water-tight dress and supplied with air by pipe and pump can go down to, and

Military Drill in Diving Suits; the Heavy, Clumsy Uniforms Do Not Lend Themselves to Snappy Formations, but the Squad Responds Just the Same

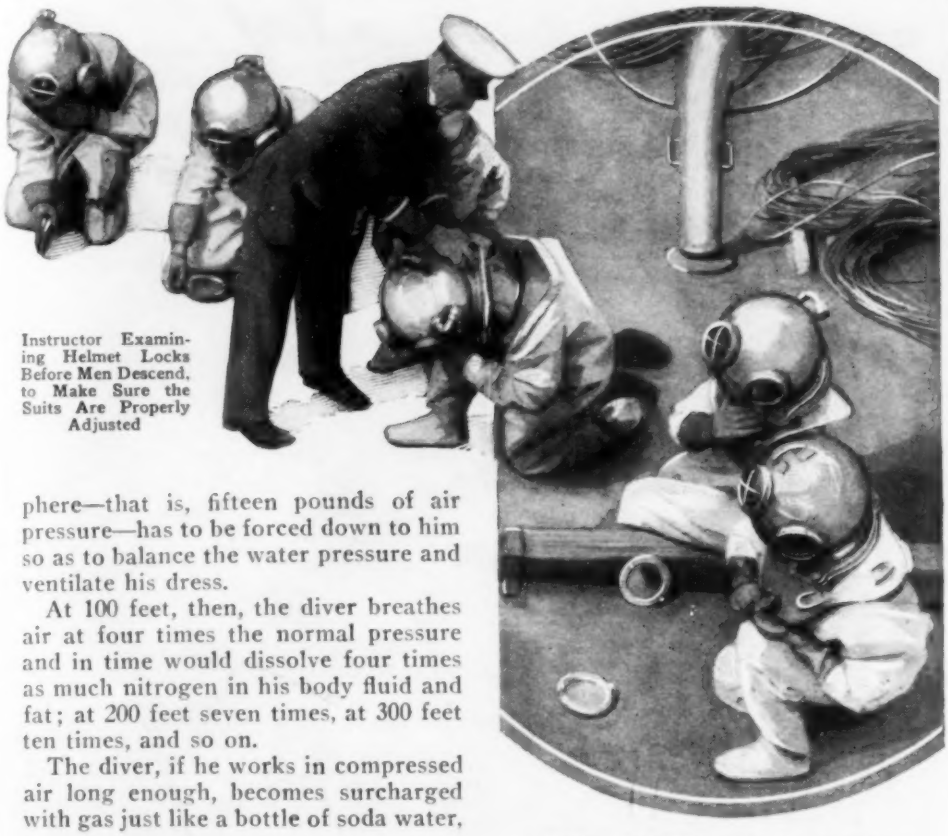
stay long at greater depths because the pressure of the water outside is exactly balanced by that of the air forced inside his dress; he is in a bath of air which is well ventilated and equally presses upon all parts of him. The amount of air in the dress is exactly controlled by inlet and outlet valves fitted to the helmet and which the diver adjusts.

Heavily weighted as he is, to overcome the buoyancy of the air in his dress, the diver, by adjusting the amount of air in his dress, makes himself light enough to move easily about on the bottom; too much air would of course float him up. A trick played on a novice is to pump air down so as to distend his dress and float him up. As he rises and the pressure of the water becomes less his dress becomes ballooned out and finally rigid with air, so that he cannot bend arm or leg and floats helpless on the surface.

For every thirty-three feet a diver goes down in the sea, an extra atmos-



Learning to Dismantle a Salvaged Wreck; Practice of This Sort Gives the Divers Valuable Training in Undersea Duties Where Mistakes Might Cost Lives and Property; the Men Become Familiar with Many Types of Boat Construction



Instructor Examining Helmet Locks Before Men Descend, to Make Sure the Suits Are Properly Adjusted

phere—that is, fifteen pounds of air pressure—has to be forced down to him so as to balance the water pressure and ventilate his dress.

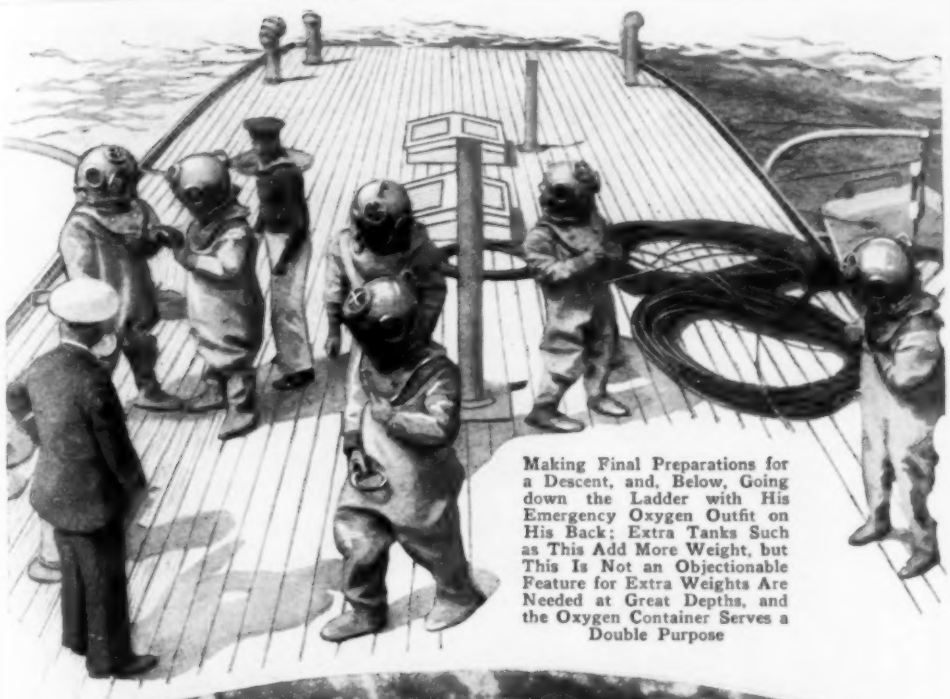
At 100 feet, then, the diver breathes air at four times the normal pressure and in time would dissolve four times as much nitrogen in his body fluid and fat; at 200 feet seven times, at 300 feet ten times, and so on.

The diver, if he works in compressed air long enough, becomes surcharged with gas just like a bottle of soda water,

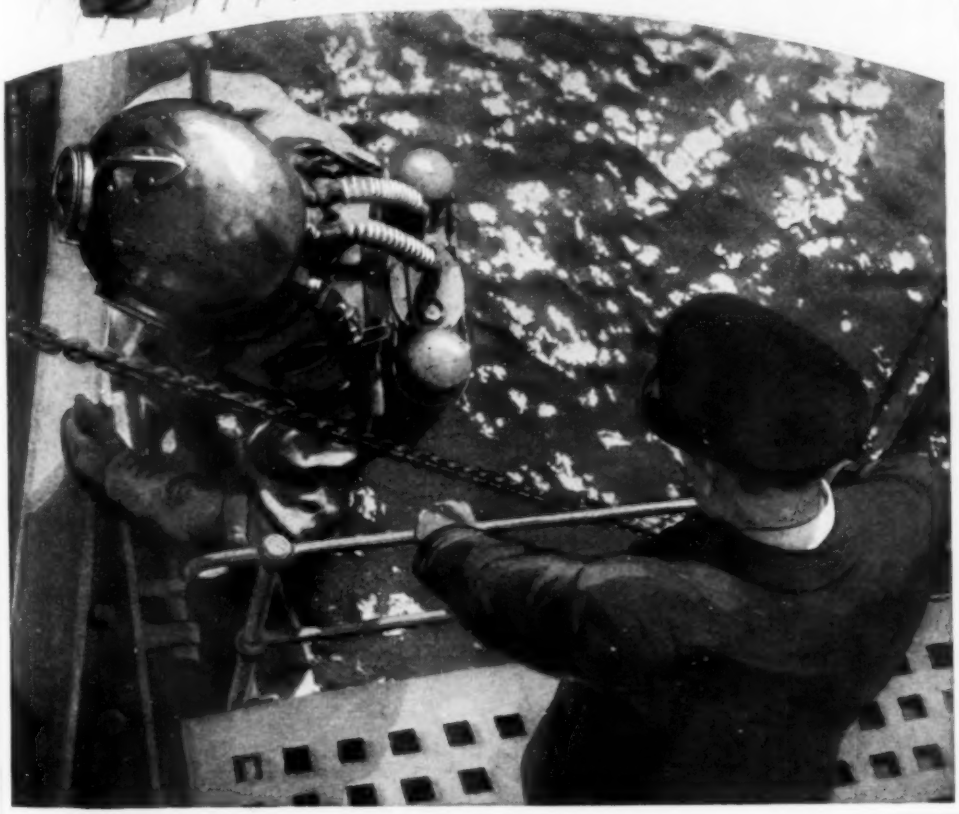
Testing Explosives on Land to Make Sure They Will Work Right under Water

Instruction in Sawing; Again the Practice on Land Gives the Divers Training for Work under Water; Severing Bolts, Heavy Timbers and Other Parts Is Often an Important Part in Submarine Salvage, and There Are Several Tricks to the Process Which Must Be Learned

A Brief Rest between Duties; in the Rear Is an Old-Fashioned Diving Bell Which Has Long Been in the Possession of One Family; It Has Been Replaced by Modern Units, Electrically Lighted and Equipped with Telephones and Air-Conditioning Devices, So That the Occupants Can Descend to Greater Depths



Making Final Preparations for a Descent, and, Below, Going down the Ladder with His Emergency Oxygen Outfit on His Back; Extra Tanks Such as This Add More Weight, but This Is Not an Objectionable Feature for Extra Weights Are Needed at Great Depths, and the Oxygen Container Serves a Double Purpose



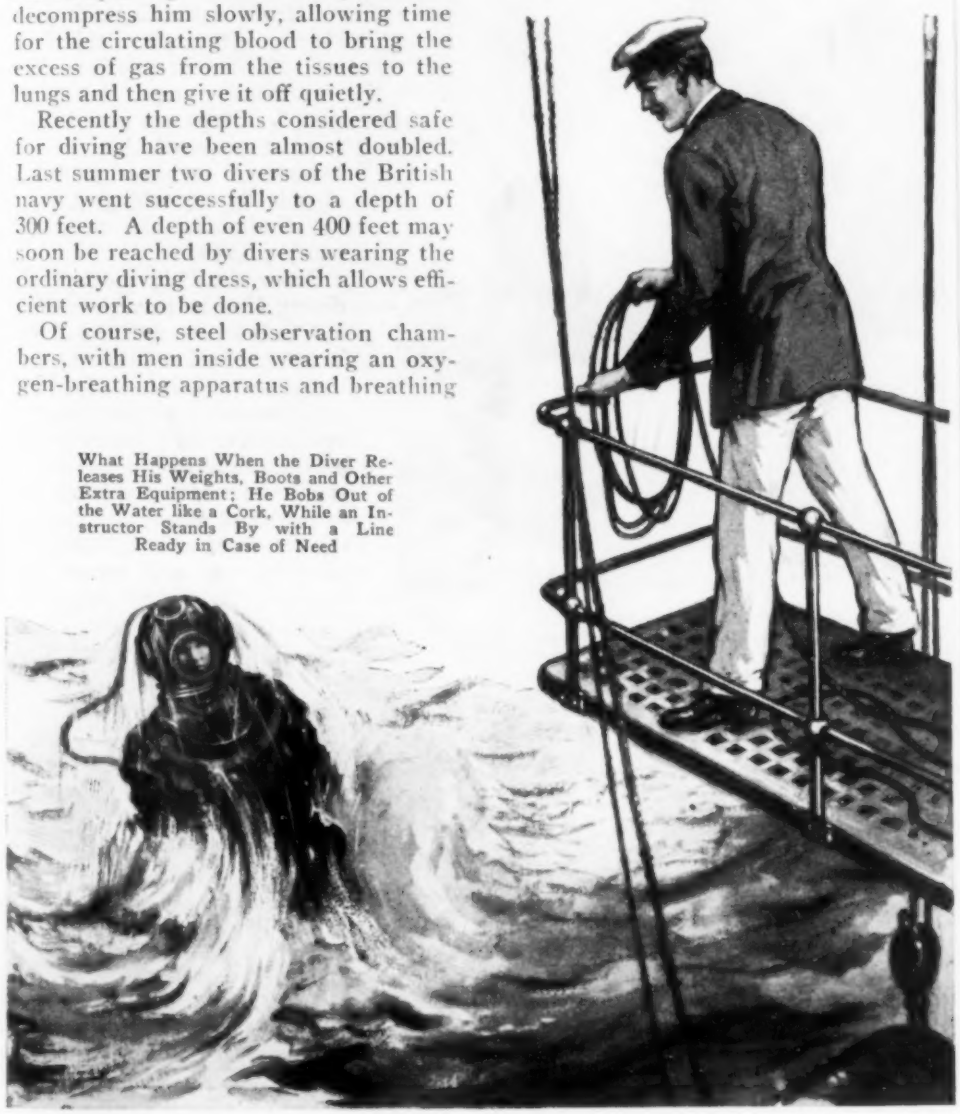
Besides Practical Knowledge, Diving Students Are Required to Have a Certain Amount of Theory; Here the Men Are Learning How an Air Pump Functions; Below, Further Training in Dismantling an Old Wreck; an Important Detail of the Task Is to Learn to Handle Heavy Timbers without Damage to Lines or Suits

and if he comes up too quickly to the surface, the gas effervesces in his blood just as soda water. The gas set free in the blood, if sufficient in amount, may stop the circulation by filling the heart with froth and so kill the diver; if too little, it may cause mischief in the nervous system, resulting in paralysis, or it produces severe pains called "bends." The remedy for bends is to put the diver in compressed air again and make the bubbles of gas shrink up and go into solution, and then decompress him slowly, allowing time for the circulating blood to bring the excess of gas from the tissues to the lungs and then give it off quietly.

Recently the depths considered safe for diving have been almost doubled. Last summer two divers of the British navy went successfully to a depth of 300 feet. A depth of even 400 feet may soon be reached by divers wearing the ordinary diving dress, which allows efficient work to be done.

Of course, steel observation chambers, with men inside wearing an oxygen-breathing apparatus and breathing at ordinary atmospheric pressure, may be lowered to far greater depths—even a mile if suitable gear could be devised. With the aid of thick glass windows and an arclight, the man inside might be able to observe and photograph the life in the depths, but he cannot do efficient work.

To prevent solution of much nitrogen gas in the body, the diver goes down quickly and works only for a short time in the greater depths. To



What Happens When the Diver Releases His Weights, Boots and Other Extra Equipment; He Bobs Out of the Water like a Cork, While an Instructor Stands By with a Line Ready in Case of Need

allow the safe escape of the dissolved gas, he makes the ascent in stages, pausing as directed by telephone from above, hanging on his "shot" rope until ordered to come up another stage. Time is thus given for the excess of nitrogen to escape from his lungs.

The pressure of air in and outside the drum of the ear has to be equalized as the diver descends, by swallowing or by a forced expiration, made with mouth and nose shut. A cold in the head may make this difficult, and pain is then felt in the ears. At, say, ten atmospheres' pressure there is ten times the volume of air in the helmet, and ventilation has to be made ten times as great to keep the carbonic acid exhaled by the diver from increasing in amount.

Thus, if one pump is sufficient for one atmosphere, ten pumps are needed for ten atmospheres. In old days, divers suffered from carbonic-acid poisoning, owing to ignorance of this fact and want of sufficient ventilation. To work the ten hand pumps, thirty-six men are needed. Steps are now being taken to prevent accumulation in the helmet of carbonic acid by chemically absorbing it and so eliminating the need of many pumps.

Since the "big money" in diving lies in salvage work, it is easy to see that the diver has first of all to know about ship construction. He has to know how to put on, or around, the hull heavy steel hawsers in absolute darkness, and he can have no doubt as to how and where and when to use dynamite. For this purpose, an old wreck is

Explaining the Purpose of the Different Parts of the Diving Suit; Examining the Heavy Soles of the Boots, and, Below, Adjusting Helmets

Close View of the Helmet; This Is the Most Important Part of the Outfit, as It Seals the Rest of the Suit

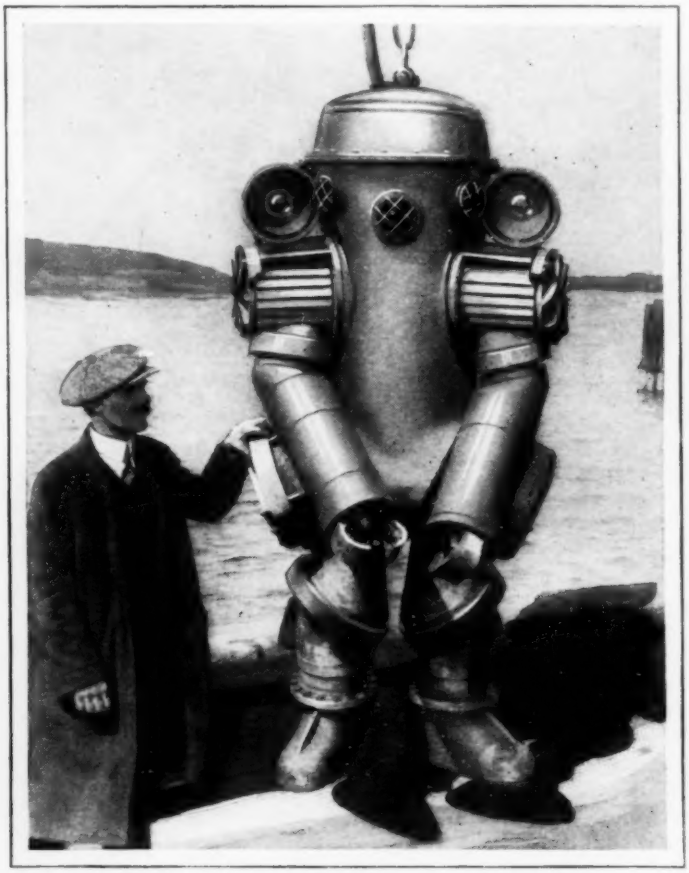
pulled on land, and with this ideal method of instruction, the pupil in the divers' school learns the things to be done and those to be left undone under water, in full daylight with neither a diver's suit to hamper his movements nor dangerous deep-sea animals to bother him. To learn the effectiveness of explosions, a special wall is built on which the different powders are tested. In shallow water, the diver learns quickly how to move around and how to handle the various apparatus hanging around him.

In deep-sea work, the crew handling the pump on board of the ship follow the diver's movements on the ocean ground by the bubbles, but the diver himself has to attend to the atmospheric valve of his suit; he has to regulate the upward pressure; he has to manipulate the line over which he communicates with the ship; he has to move in the same direction in which he is lowered to avoid being caught in the airline, and, besides, he has to attend to the work for which he descended.

Besides the practical work, there are other studies without which the diver could not afford to either start a big job or even obtain it. He has to know about the transparency of the water, the pressure in different depths, the general condition of the ocean ground, the prevailing currents of water as well as wind, the meteorological handicaps, and many other things. He even has to know all tlie seven seas of the world, for he may be called one day to Egypt and the next to Scandinavia.

A first-class diver must have courage and ingenuity. Imagine a moment of sudden danger. There is no time for any kind of schedule or even quick planning, fractions of a second lost may mean instant death. Divers' wages vary greatly. Some have received as high as $1,000 or more for a single day's work when recovery of a specially prized object or the rescue of human life was the goal. Salvage companies pay their divers an average of $100 a month and $50 for every dive.

There is always a demand for experienced divers. The shipyards need them and the shipping companies cannot do without them for repair and salvage work. The navy has at least one diver attached to the big units and to groups of the torpedo boats and destroyers. If a ship pulls out and a line is caught in the screws, if there are difficulties with the anchor, if something of value drops into the sea, if the hull is leaking, always the call goes out: "Diver over board."



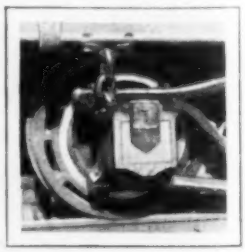
All-Metal Diving Suit Equipped with Telephone and Electric Headlights, for Salvage Operations at Depths of 200 Feet or More

METAL DIVING SUIT HAS PHONE AND ELECTRIC LIGHTS

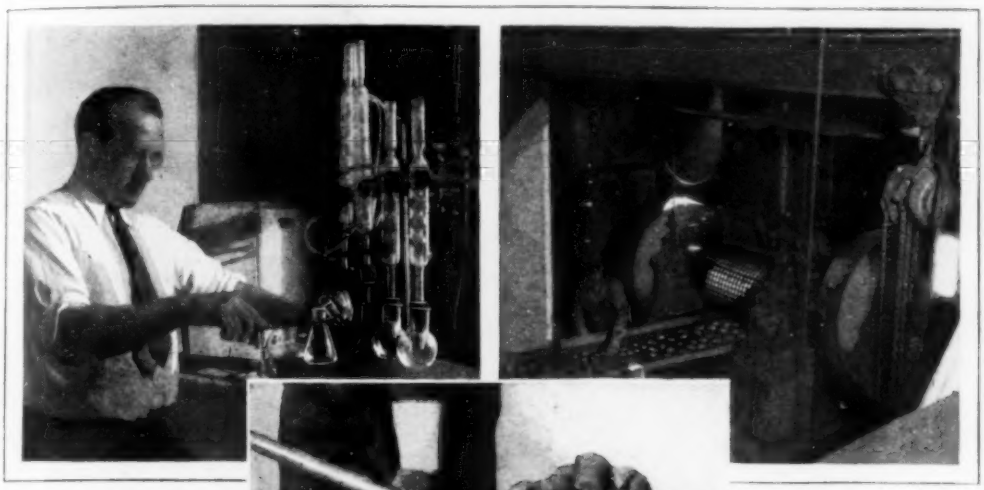
Equipped with telephone and powerful electric lights, an all-metal diving suit, for salvage operations at depths of 200 feet or more, has recently undergone successful tests. The suit makes it possible to remain long at great depths, to move about freely, and to return quickly. Air is furnished through a cable, circulated through the suit and returned to the surface, thus making it possible for the diver to breathe air at atmospheric pressure. This makes decompression unnecessary when the diver is raised, and in the tests, a man was brought to the surface in one minute and fifty-two seconds after being in 210 feet of water for more than an hour. The suit was made for a company which expects to salvage the treasures of wrecked vessels, and, for use with it an observation tank was built along somewhat similar principles to be operated by two men. It is intended to locate wrecks with a sonic finder, explore the wreckage from the observation tank, also equipped with powerful lamps, and do the actual salvage work with the diving suit after the valuables have been located from the tank.

RUBBER CUSHION ABSORBS TRAIN SHOCKS

Greater comfort for passengers is an advantage claimed for a rubber-cushioned railway-car wheel now being manufactured. It is much like the all-steel wheel, except that a cushion of uncured rubber is built between the hub and rim. A pocket inside the wheel holds the rubber pad which measures about two and one-half inches thick and six inches wide, tapering toward the edges. Tests have shown that such wheels can be used for the drive-wheels of the largest locomotives. The cushion absorbs shocks and reduces side-sway, and when used on locomotives, makes starting smoother. After a rim has become worn, the hub is still good, and can be used again by fitting another cushion and rim to it. Heat developed by brakes is dissipated before reaching the rubber by slits cut in the outer section of the wheel. The wheel and the cushion are vulcanized together like a truck tire to the rim.



MAN-MADE ANTHRACITE RIVALS WORK OF NATURE

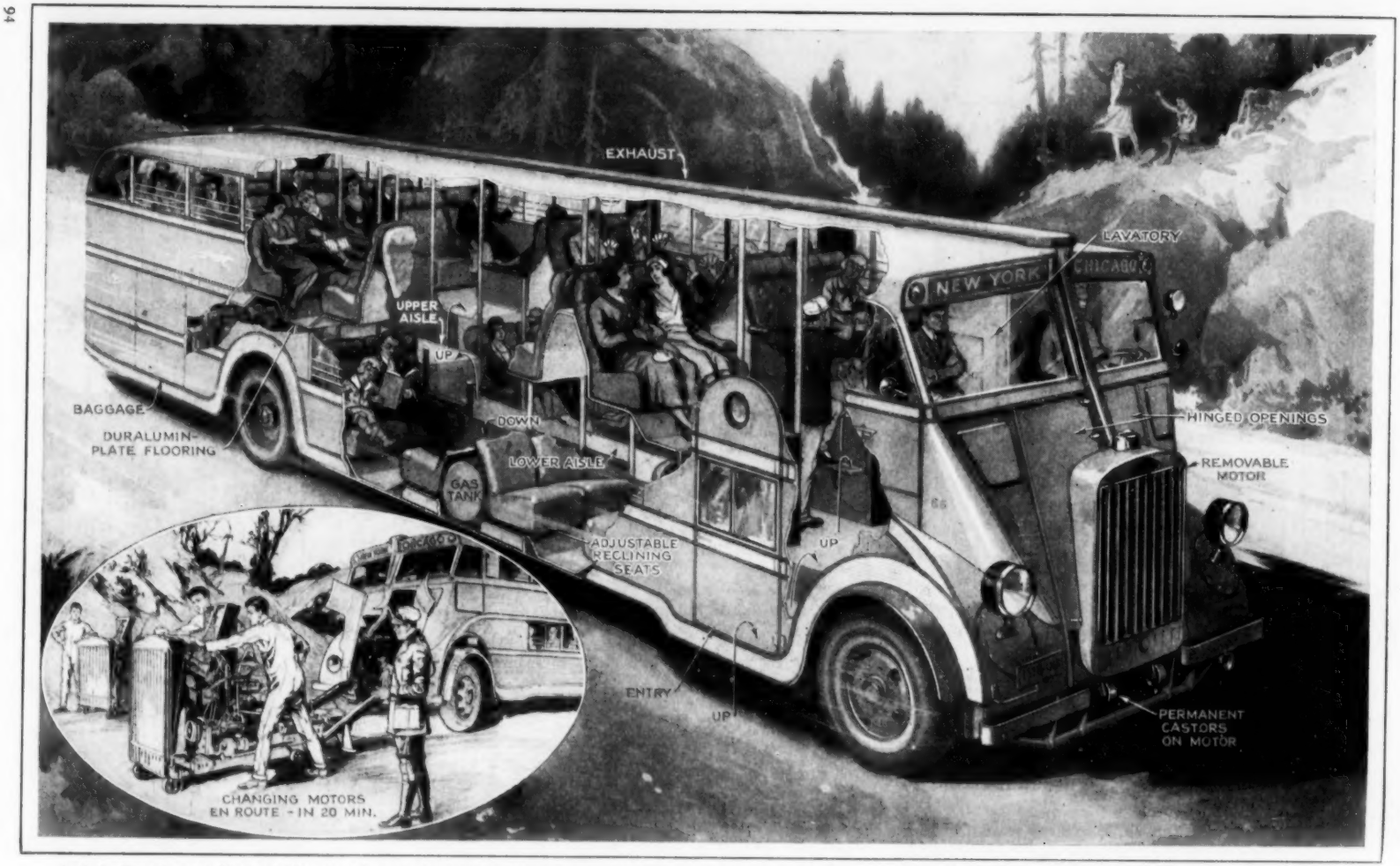


Making Chemical Tests on the Briquettes; View of the Press and Shovelful of Briquettes

Nature spent thousands of years in forming anthracite coal but now it is being made in less than four hours from ordinary soft coal, which is converted into a hard, long-burning smokeless fuel that leaves less ash than natural anthracite, gives a hotter and more even fire and is handled with less waste and with absolutely no dust. Incidentally, the product, which comes in small briquettes, sells for less than anthracite, and the patented manufacturing process yields larger quantities of valuable tar and richer gas than are obtained from ordinary coking operations. The process is the invention of Clarence S. Lomax. As the coal enters a carbonizer, or retort, from the top and descends to the bottom, it is progressively heated until it leaves at a temperature of some 750 degrees Centigrade. The heat drives off the volatile materials which are drawn by suction into a separator, where, by an electrical method, the tar is literally knocked out of the gas. The gas goes into a gasometer and the tar into a cistern. The black char remaining is carbonized coal which is of such a plastic structure that it can easily be ground and sifted and then briquetted.

DISCOVERY OF BLOOD GROUPS WINS NOBEL PRIZE

Discovery that human blood is of four different types, and that blood of one group does not always mix well with that of another, has won the 1930 Nobel prize in medicine for Dr. Karl Landsteiner, of the Rockefeller Institute of Medical Research. Daily use of this discovery is made in blood transfusions, the bloods of the prospective donor and patient being tested to determine if they belong to compatible groups. Incompatible groups, when brought together, often clump, or agglutinate, and such a condition often results in death. Doctor Landsteiner found that agglutination did not occur at random, but depended on certain definite properties of the blood, and it is on the basis of these properties that the four groups were formed.

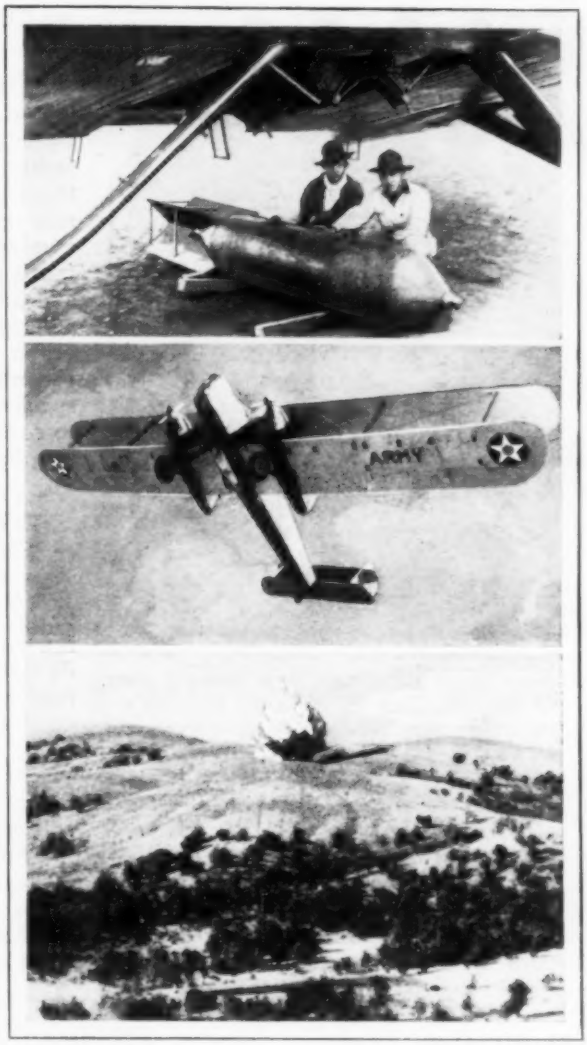


Artist's Drawing of Modern Motorcoach with Interchangeable Motors and Many Other Unusual Features; This Type of Coach Can Carry Fifty-Three Passengers, Twenty More than Older Busses of About the Same Size; Note Unusually Large Seat and Aisle Spaces

Artist's Drawing of Modern Motorcoach with Interchangeable Motors and Many Other Unusual Features; This Type of Coach Can Carry Fifty-Three Passengers. Twenty More than Older Busses of About the Same Size; Note Unusually Large Seat and Aisle Spaces

DITCH RIDER REPLACES COWBOY CHARACTER OF THE WEST

Ditch riders are replacing cowboys as colorful and picturesque figures of the new west. Instead of watching cattle, the ditch riders guard millions of acre-feet of water delivered annually to more than 40,000 farms on twenty-seven government projects. Throughout the irrigation season, the rider may be seen daily at his task on any of the 16,557 miles of canals, ditches and drains supplying water to waiting farmers. He dresses like the cowboy with boots, spurs and sombrero and often carries a gun to wage war on rattlesnakes and coyotes. A spade, a grubhoe and a water-delivery record book are standard equipment. A canal break to him is as serious as a stampede to the cow puncher, and often he rides steadily for the entire irrigation period of four months without a day off. Where orchard land is valued at $1,000 an acre, a half hour of uncontrolled water milling through a break may mean damage of thousands of dollars. The rider makes many halts to take gauge readings, to investigate seepage conditions and to clear the canal of obstructions. The allocation of water calls for infinite care as deliveries are computed to the fraction of an acre-foot. Behind the ditch riders are the hydrographic experts in the mountains, estimating in advance each season's probable water supply, the reservoir tenders who watch over government dams, and the operation and maintenance engineers.

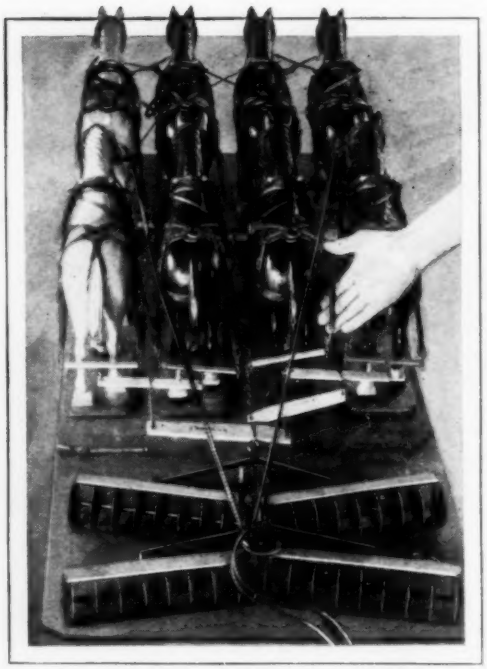


Episodes in a Bomb's Life; the Big Missile Ready for the Plane, in Flight, and Tearing the Top off a Granite Hill

ONE-TON ARMY BOMB BLOWS TOP OFF GRANITE HILL

The terrific force of one of the large demolition bombs used by the army was illustrated recently when a one-ton projectile of this kind was dropped from an airplane. It was aimed at and struck the top of a granite hill, blowing a huge crater and scattering debris over a wide area. Making the bombs, preparing them for use, installing them in their carriages under the planes and, finally, releasing them at the proper instant, are the tasks of a special division of the air corps. Target practice is usually conducted without firing real bombs, but occasionally live ones are used to test not only the marksmanship of the men but the quality of the explosives as well.

¶The ban on the importation of parrots, established during the parrot-fever outbreak, has been lifted.



Miniature Horses Demonstrate Team Hitching; Note the Spreaders Which Distribute the Task Evenly

HARNESSING HORSES IS TAUGHT BY SMALL MODELS

Various complicated hitches in grouping horses into large units are demonstrated to farmers by the Horse Association of America with the aid of miniature animals, sets of harness and farm machinery. Based on department of agriculture figures and estimates, this organization declares that more than 107,000,000 acres of land would be devoted today to maintaining animal motive power if the horse and mule ratio to population had kept pace with the 1900 ratio. Instead, less than 53,000,000 acres is used for this purpose, the rest being devoted to the production of grain, much of which represents surplus. From 1920 to 1930, the organization estimates that horses and mules have decreased by more than 7,000,000 in this country, this number of animals formerly requiring more than 18,000,000 acres of land for maintenance, and blames the decrease in horses for part of the grain surplus.

VACUUM TUBE BECOMES NURSE FOR BABY AT NIGHT

At least one father has solved the problem of caring for the baby at night by assigning a vacuum tube the task. The father, an engineer with the General Electric company, places the baby in a separate room with a telephone transmitter as a microphone beside the crib. The infant's cries are carried to the amplifier and loud speaker beside the father's bed, whereupon the father turns on a phonograph without getting out of bed and the recorded lullaby sounds through a loud speaker near the crib. If the lullaby fails to soothe, then only must personal attention be given.

NEW VARIETY OF SUGAR CANE YIELDS MORE PER ACRE

A new variety of cane that yields one ton per acre more of sugar than any other known kind and is free from the mosaic disease which has depleted many of the fields of the south, has been developed by government scientists. The variety is a cross produced from other kinds after extensive tests. Because the new cane has proved its ability to resist disease, it will probably be successfully cultivated in the heavier types of soil to be found in the cane belt, and although its crooked stalks and heavier fibers may add to harvesting and milling costs, this is expected to be offset by the increased yield.

Testing Juice of the New Variety of Sugar Cane Which Yields More per Acre and Resists Disease

ELECTRIC BREEZE ROCKS TREES TO AID GROWTH STUDY

Every day for the last two and one-half years, three dozen Monterey cypress trees, far removed from their native California, have been swaying back and forth in a mechanical breeze while Prof. William S. Cooper, of the botany department of the University of Minnesota, seeks to determine how unusual weather conditions affect their growth. The breeze, produced by an electric motor which moves a sliding frame attached to the trunks of the trees, "doubles" for the Pacific coast winds and has enabled Professor Cooper to prove that sides of the trees not opposed to the strain have added almost ten times as many cells as the other sides. This experiment contradicts the popular belief that a tree exposed to the wind from one direction will compensate for the strain by adding cells in a plane in the direction of the strain. Professor Cooper believes that the growth is a result of hampering cell activity due to the strain imposed. This is much greater on the sides which sway. "Gravity seems to affect the trees, making them gradually assume an elliptical shape," said Professor Cooper. "I have several trees growing horizontally in which all the new rings are below the original trunk."

POWER SAW'S CARRYING CASE USED FOR WORKBENCH

Combining portability and power, an electric saw is so constructed that its carrying case can be used as a workbench when the saw is in operation. All tools and gauges can be locked in the case, which weighs seventy-five pounds packed. The saw is mounted directly on the shaft of the motor and the case has an adjustable cover for angle cutting, while the rip gauge may be used on either side of the saw.

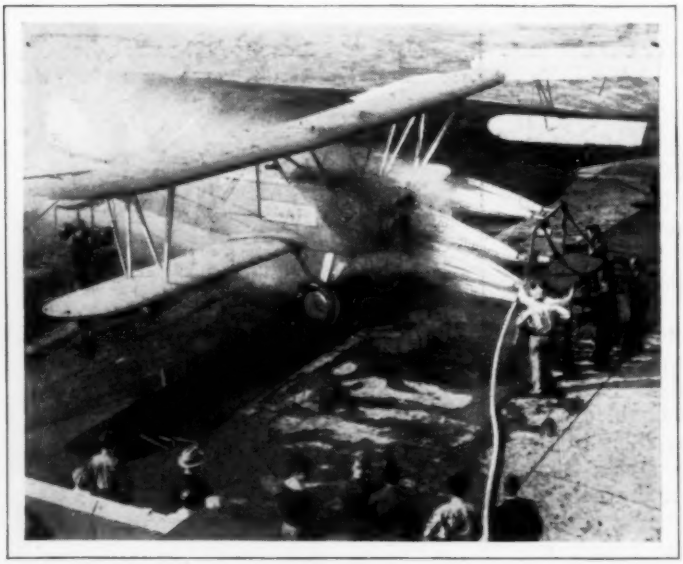
Winter Outfit for the Army Flyer; Note the Face Mask and Warm Flying Suit and Moccasins

ARMY FLYER'S WINTER OUTFIT CONTAINS NINE PIECES

To keep the army flyer comfortable in zero and subzero temperatures, an exceptionally warm winter outfit has recently been approved for military aviators. It consists of a blanket-lined flying suit, warm winter helmet, a mask for the face, goggles, a pair of two-finger gloves, fleece-lined moccasins and the regulation parachute seat pack and harness.

RIFLE SHOTS SHATTER ICEBERG TO PROTECT DIVERS

By means of rifle shots, workmen shattered a large iceberg that threatened to wreck divers' scows anchored off Juneau, Alaska. A huge berg had drifted from a glacier over the cables used by the divers. Steam tugs worked unsuccessfully for an entire day in an effort to dislodge it. At last, armed with rifles, the workers opened a barrage on the big berg and finally made a deep fissure in its center. This caused the ice to break and split up into smaller sections which soon drifted harmlessly out to sea.



Giving the Storm Test to an Airplane Motor Equipped with Rain Protectors; Water under Pressure Is Turned on the Running Engine

RAIN TEST FOR PLANE SHOWS RESISTANCE TO STORMS

In order to test the resistance to violent downpours of an airplane engine equipped with rain protectors, several streams of water under high pressure were turned on the motor while it was running at full speed in a recent demonstration in Chicago. The engine ran for nearly half an hour with the hose shooting water at it to simulate conditions the plane would encounter in flight in a heavy rain.

X-RAY PHOTOGRAPHS OF ATOMS SPEED WORK OF SCIENCE

Development of an X-ray tube which makes "snapshots of atoms" in one minute instead of the 100 hours or so usually required for such work, is heralded as a great aid to science in that it opens up a wider field of research and industrial development. Dr. George L. Clark, professor of chemistry at the University of Illinois, where the tube was devised, explains that it can be used in studying how cellulose is made over into artificial silks and thus help in improving the material; how cancers are formed and how they grow, and how gallstones originate and develop. X-ray photographs of atomic changes would be useful in practically every chemical process except where the changes take place instantaneously, Doctor Clark points out. The tube does not photograph the actual atoms, but rather the patterns and arrangements they form. The pictures are not the familiar shadow photographs.

ONE-MAN PIANO MOVER FITS ON AUTO

With the aid of a simple apparatus now on the market, one man can move and load a piano. The outfit is made of steel piping, rods and angle iron and fits on the rear of coupes or roadsters. It consists of a lifting platform and standards which are attached to the running boards and support the platform. When the piano has been moved up on the platform, it is swung back to position for carrying by means of a ratchet crank. The weight is equalized between the bumpers and the running board so that there is no undue stress on any part of the car. Besides being useful for pianos, the rig may also be employed in transporting radio sets, refrigerators and other large articles.

Movable Metal Platform Attached to Auto, by Which One Man Is Able to Load and Move a Piano

Lieutenant Gardner's Plane during Spectacular Maneuvers over Washington; a Splendid View of the Ship in Inverted Position at the Top of a Loop; Safe Altitude Is an Essential in Stunting

APPARENTLY defying all the laws of gravity, three navy planes dived with terrific speed over the naval air station at Anacostia not long ago and developed three spectacular feats of aerial acrobatics never before accomplished, besides practicing six other maneuvers almost equally death-defying.

Two of these new formations, known as the "reverse loop" and "push-over," were entirely new, while the third consisted of a bewildering five-minute period of upside-down flying at a speed of 120 miles per hour that, for close-range inverted flying, is believed to be unparalleled. This was No. 9 of the stunts.

How were these difficult feats performed, how prepared for and what were the ticklish situations experienced by the flyers in developing these sensational maneuvers? Such were the questions asked of Lieut. M. B. Gardner, leader of the navy squadron which performed them, with the help of Lieuts. A. P. Storrs and F. M. Trapnell. Lieut. Gardner explains:

"For our program of aerial acrobatics we started out by diving on the field in standard Vee-formation from a height of 2,500 feet, the leader (myself) flying upside down while the other two maintained normal position down to a height of 500 feet. Next we pulled right out of this formation into a climbing turn and then I signaled for formation No. 2 to begin. At this point, I rolled, right side up, out of the climb to an altitude of 1,000 feet. Now, of course, all three of us were flying right side up. Whereupon we did some wing-overs, dipping into what is known as an exaggerated chandelle, really a heavily banked climbing turn of about ninety degrees.

"Formation No. 3 consisted of a series of loops starting at about 2,000 feet and ending at an altitude of approximately 500 feet. These loops were in formation, one right after the other.

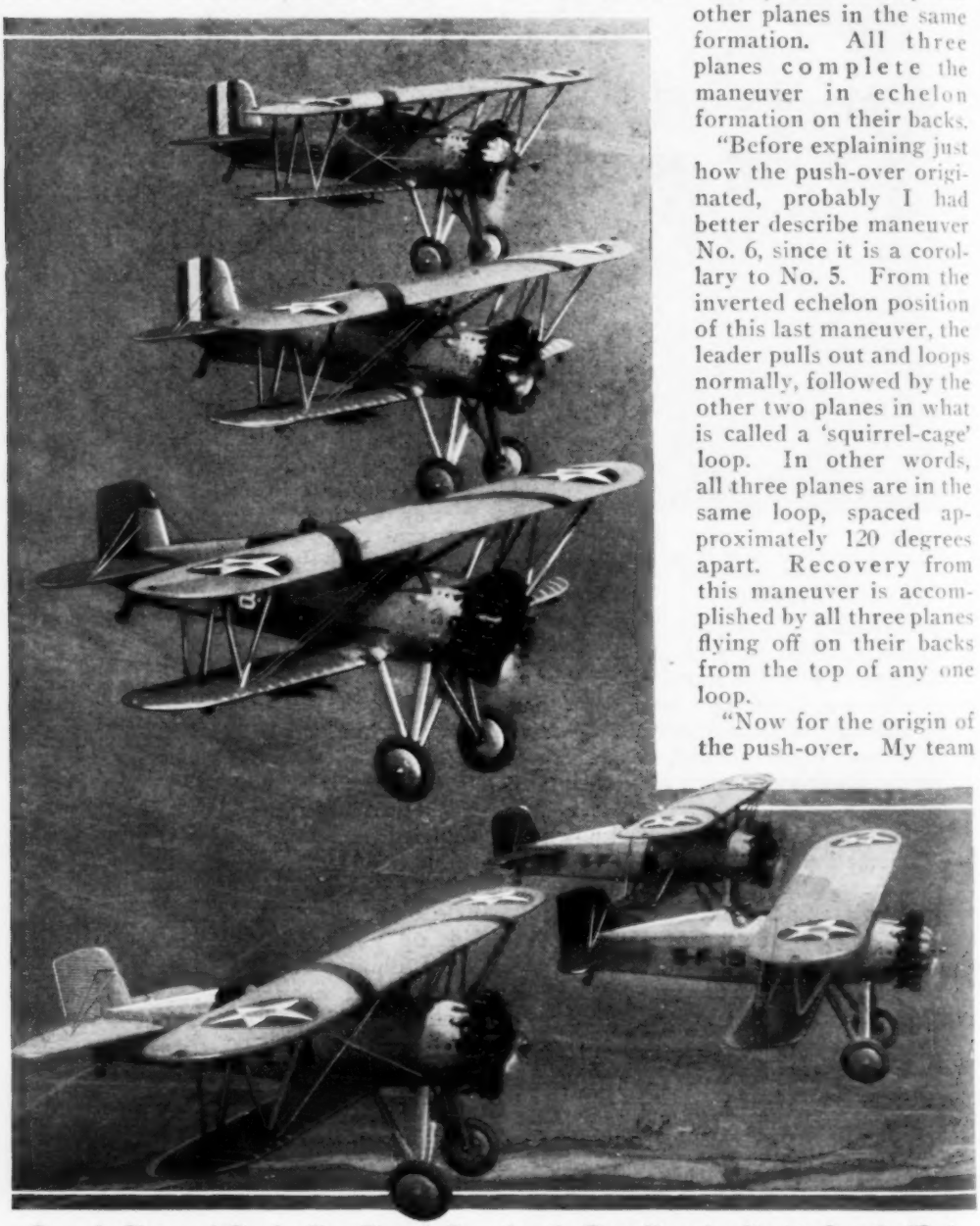
"Then came, as No. 4, a curious little aerial stunt, called 'leapfrog.' In this the trio of planes goes into echelon formation

which is broken by the leader who does a snap roll toward the other two planes, rolling up and over them. This places him in the rear and leaves No. 2 plane in first position for a similar leap over him and the third plane.

"Maneuver No. 5, a newcomer into the field of aerial acrobatics, is also accomplished from an echelon formation—planes arranged in the form of steps. Starting at an altitude of 3,000 feet and ending at around 500 feet, the name of this maneuver is the push-over, so-called because the leading plane actually pushes over in the first half of an outside loop, coming out on its back closely followed by the other planes in the same formation. All three planes complete the maneuver in echelon formation on their backs.

"Before explaining just how the push-over originated, probably I had better describe maneuver No. 6, since it is a corollary to No. 5. From the inverted echelon position of this last maneuver, the leader pulls out and loops normally, followed by the other two planes in what is called a 'squirrel-cage' loop. In other words, all three planes are in the same loop, spaced approximately 120 degrees apart. Recovery from this maneuver is accomplished by all three planes flying off on their backs from the top of any one loop.

"Now for the origin of the push-over. My team



Composite Photograph Showing Navy Planes in Formation; the Three Above Are About to Start the "Push-Over" and "Leapfrog" Stunts; Those Below Are in the Standard Vee Formation

mates and myself conceived the idea of devising some variation of the squirrel-cage loop which would be novel as well as spectacular. So for many hours over the naval air station at Anacostia, we practiced the squirrel cage, finally coming upon the push-over idea.

"No doubt, most experienced flyers are familiar with the 'slow roll,' which was our maneuver No. 7. One might sum it up by saying that it is a variation of the familiar snap roll though a prettier maneuver by far. It is executed as follows: Starting at an altitude of 1,000 feet, and maintaining that height throughout, execute a slow roll in a Vee-formation. Comparing this with a snap roll, the main difference lies in the fact that the slow roll utilizes half again as much speed; the plane is controlled all the way through the roll by the ailerons only, the actual rolling movement being much slower.

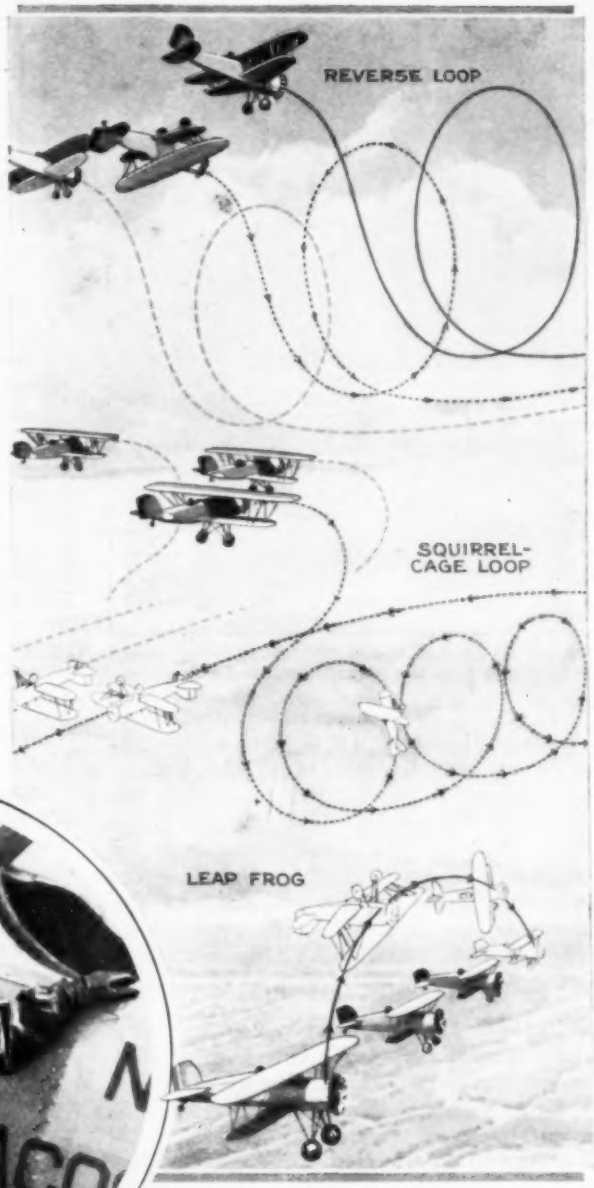


Diagram of Three Difficult Maneuvers, and Lieutenant Gardner, Leader of the Navy's Trick Group

"Maneuver No. 8 was one developed by myself and my mates in recent weeks which had never before been performed. We call this a reverse loop, and I consider it one of the most difficult aerial feats because every manipulation of the controls is the exact reverse of normal. Starting at an altitude of about 3,000 feet, the three planes execute a loop in Vee-formation with the leader flying upside down. As the leader does a complete outside loop, the other two pilots simultaneously execute normal loops. All planes finally come out of this maneuver at an altitude of about 2,000 feet."

MUFFLER FOR AIRPLANE MOTOR "CHEWS UP" SOUND WAVES

Muffler for Airplane Motor, Which "Chews Up" Sound Waves from Engine and Deadens the Noise

Invented by a woman, a muffler to deaden noises from an airplane motor underwent operating tests recently. A series of fans inside the muffler represents the heart of the device. It is claimed these fans "chew up" the sound waves from the engine and draw in the exhaust gases without impairing the efficiency of the motor.

AN ELECTRIC MICROMETER

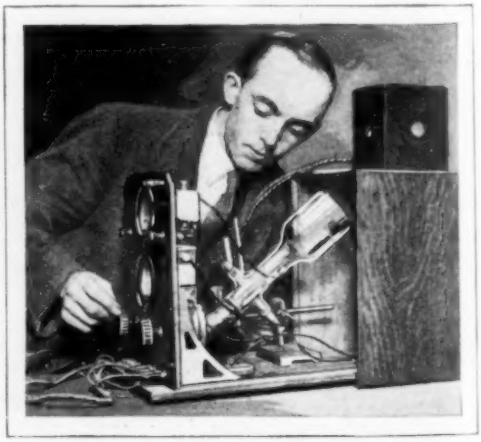
Replacing the ordinary micrometer and optical methods of measuring very thin objects, such as fine wires, a recently developed German electrical micrometer is accurate to the ten-thousandth of a millimeter, and demands little skill to operate. The instrument consists essentially of an anvil, spindle, indicator and lamp, the latter being lighted by means of an ordinary pocket battery. The indicator is set to the diameter of the wire to be checked, and this sets the distance between spindle and anvil to the correct measurement. When the wire is drawn over the anvil to touch the spindle, the lamp lights if the diameter of the wire is too great to pass between the two, so that the instrument, thus set, serves as a "not-go" gauge. To measure the wire, the spindle is adjusted so that the wire, passed between spindle and anvil, will cause the lamp to flash momentarily. The diameter of the wire can then be read directly on the indicator.

DIN OF MODERN CITY WORSE THAN LION'S ROAR

Auto horns, riveting machines, steam shovels, trucks, and other units, create a din that is louder than thunder at three miles' distance and drowns out the roar of the lion, scientists have discovered. Forty per cent of the auto horns were found louder than a lion's voice and were even worse than riveters. While the city din does not inspire terror as does a wild animal's roar, city noises, physicians have proved, are a contributing cause to deafness, produce irregular heart rhythm, cause unnecessary fatigue and seriously interfere with the development of children.

LIGHT FROM RADIO TO PREVENT COLLISIONS OF SHIPS

Designed to prevent collisions of ships when visibility is poor, a fog-navigation compass utilizes the very sensitive cathode-ray oscillograph tube to transform wireless signals from near-by vessels into visible beams of light. The apparatus changes the signals into a spot of light on a screen which becomes a beam indicating to the navigator the directions other ships are pursuing.



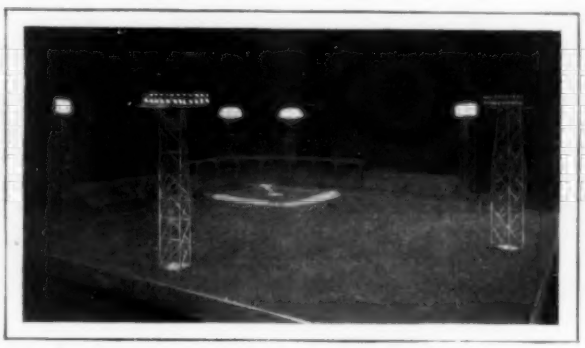
Sensitive Cathode-Ray Oscillograph Tube, Which Forms Heart of a Fog-Navigation Compass

LADYBUGS TO DESTROY PESTS ARE MINED IN MOUNTAINS

Mining ladybug beetles has become a profitable occupation for many mountain rangers who seek small dens and caves along rocky ledges of the Pacific coast states where these insects are found during the early winter months. Ladybugs originally were imported from China by western vegetable and fruit growers because they prey on the aphis and larvæ of harmful insects. In the fall these beetles migrate to the Pacific coast slopes, where they try to avoid the chill of nights by huddling in swarms in crevices and under rock piles. Collectors wait until just before dawn when the insects are dormant, then explore the crevices and piles of rock, scooping the captives into pasteboard boxes. They are placed in a temperature equal to their hibernation locality, and in the following spring are distributed to farmers and fruit growers.

BASEBALL PARK IN MINIATURE USED IN LIGHTING TESTS

Experiments with the latest methods of athletic-field illumination for night games are carried on by the General Electric company with the aid of a miniature baseball park, complete in every detail and provided with half a dozen floodlight towers. The model is a replica of the Des Moines, Iowa, baseball park which was illuminated for night playing, and is one-thirty-second of the actual size. The tiny steel towers represent originals ninety feet high, and are about thirty-four inches tall. They carry floodlights which are, in reality, flashlight lamps and reflectors.



Miniature Baseball Park, One-Thirty-Second of Actual Size, Where Illumination for Night Sports Is Studied

Aerial View of Explosion of 50,000 Pounds of Dynamite in New York Harbor to Make a Grave for a Sunken Ship

HOLE BLASTED IN HARBOR BED TO BURY SUNKEN SHIP

Fifty thousand pounds of dynamite were exploded recently on the bottom of New York harbor to blast a grave for the wreck of the sunken ship "Fort Victoria," and bury it so deep that it would no longer be a menace to navigation. An unusual photograph of the explosion was obtained from an airplane above the scene, and showed a great geyser of water spouting into the air from the force of the blast.

RUBBER-METAL RUNNING BOARD

Rubber is now being cured to the metal running boards of automobiles by a heating process, instead of the usual cementing method, resulting in permanent adhesion that makes the rubber and metal virtually a single unit. Greater durability and improved appearance are among the advantages claimed. In addition, the hazard of loose covering, which often catches a heel, is eliminated by the process.

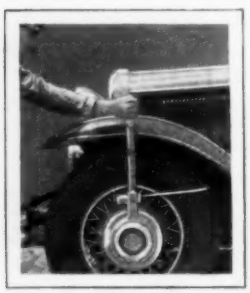
Portable Trash Burner in Which Leaves Can Be Destroyed without Doing Damage to the Lawn

PORTABLE BURNER FOR LEAVES CLEANS LAWN QUICKLY

Leaves and other lawn rubbish are disposed of quickly with a portable trash burner which consists of a cylinder mounted on a wheeled frame which in turn is supported by two wheels. The outfit, built entirely of metal, can be pulled about the lawn and the rubbish thrown in, after which the trash is burned without damage to the grass.

ONE-MAN AUTO-BRAKE TESTER SAVES TIME AND LABOR

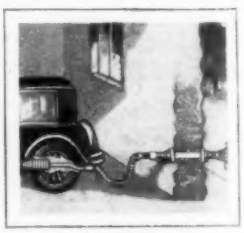
Saving both time and labor, a testing gauge and pedal depressor makes it possible for one man to test automobile brakes and correct their faults. The outfit consists of the pedal depressor used to set the brakes, adaptable rings to fit on any type of wheel hub, a lever with the gauge attached to it, and a tire hook. With the brakes set and the wheel under test off the ground, the operator pulls on the lever until the wheel turns, the gauge registering the torque or pull necessary to turn the wheel. This makes it possible to adjust all brakes to the same pressure, and the gauge pointer reveals imperfections in the lining or on the drum, so that their location can be marked.



BRIGHT COLOR OF RED PEPPERS PRESERVED WITH OZONE

Red peppers will not bleach if kept in a dark, damp place and given daily doses of ozone. Scientists, investigating a way to stop the loss due to the fading of the colors of the peppers while in storage, found that the red pigment bleached when exposed to light or when the peppers were very dry. When stored in a dark, damp chamber, however, they were attacked by mold. Ozone, even as little as one-tenth of one per cent for ten minutes a day, was found to stop the mold from forming, while the darkness and moisture prevented fading. Ozone tends to bleach the peppers if they are very dry, however, the tests indicated.

PIPE ENDS DANGER FROM GAS IN A CLOSED GARAGE



Danger of being overcome by carbon-monoxide gas while working with a running car in a tightly closed garage is prevented by a gas eliminator which attaches to the exhaust. It consists essentially of a flexible hose attached at one end to a pipe which extends through the wall of the garage, and at the other to the exhaust, thus allowing the gases to be discharged outside the building.

ZOO TRAIN HAULS SIGHT-SEERS THROUGH AFRICAN JUNGLE

Tourists who wish to get a close-up of wild animals of the African jungle in their native habitat are taken through hundreds of miles of the Sabi game reserve in the northern Transvaal on sight-seeing trains made up of observation cars and lookout posts. The trains travel about twenty miles an hour within a few feet of roaming

lions, elephants, buffalo, crocodiles, hippopotami, zebras and other jungle denizens. Lookout balconies are located at each end of the cars, and a man with a whistle rides in the locomotive, blowing one blast when he sights game to the right of the track, and two blasts for animals on the left. Sluggish hippopotami are observed floundering in a pretty river where the train enters the great zoo park in which the animals are protected by law. Often the beasts can be observed tracking down their quarry, and quite frequently the train itself is challenged by a jungle beast. Recently a hippopotamus charged a locomotive, but a cloud of hissing steam caused it to swerve and vent its wrath on a crowd which scattered precipitately. An elephant also attacked a moving train but did little damage, and a lion, pursuing an antelope, leaped on the hood of an automobile and smashed the windshield.

DOG COLLECTS FUNDS FOR AID OF HOMELESS CANINES

Homeless and friendless canines of Chicago and vicinity have been provided with shelter, food and care by an animal lover who has established a dog refuge, called "Orphans of the Storm," near that city. Some of the dog inmates of the refuge have been trained to help in raising funds to care for still other homeless animals. One large and gentle dog wears a harness to which is attached a coin holder, and goes about soliciting pennies for the refuge from children.

Dog Wearing Harness and Coin Holder Which Solicits Pennies from Children for Dog Refuge

HOMEMADE BABY INCUBATOR KEEPS INFANT ALIVE

Homemade Baby Incubator, Consisting of a Market Basket, Electric Light Bulb and a Blanket

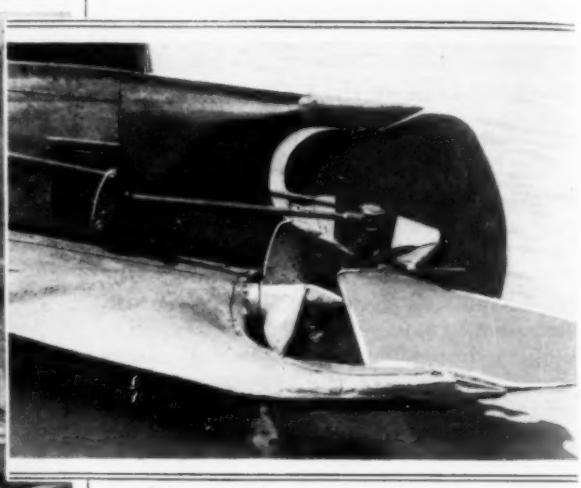
One Detroit baby whose growth was retarded by a lung infection was kept alive for several weeks in a homemade incubator that operated on the same principle as the hospital incubators in which tiny infants are placed. A market basket, a large electric light bulb and a blanket were the essential parts of the homemade heater, in which the baby lived and gained one pound in three months.

BEES WEAR THEMSELVES OUT KEEPING WARM IN WINTER

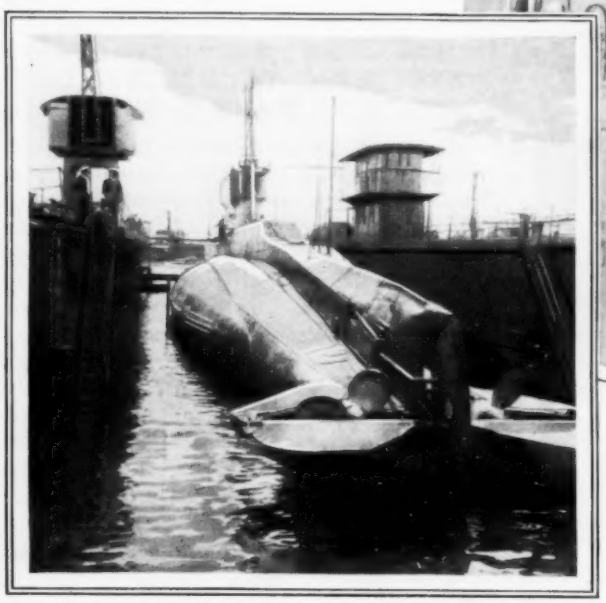
Bees which do not have sufficient winter protection from cold wear themselves out trying to keep warm by constantly flapping their wings, just as people wave their arms to generate heat. Bees cannot replace or repair worn-out tissues like other living creatures, and every flap of their wings brings them nearer death, bee experts have found. They form in clusters in the hive to keep warm, fitting so tightly that those on the outside act as insulators. Unless the hives are protected with packing cases and windbreaks, the bees age and die more rapidly because of their exertion, being replaced by young bees and creating a condition which beekeepers call the "spring dwindles."

THE LATEST INS AND OUTS OF MODERN SUBMARINE

Interior View through the Fore Hatch; Some of These Photographs Were Taken with a Newly Developed Flashlight, Ignited by a Pocket Battery and Free from Fire Hazard; Note the Efficient Utilization of All Space



Few Persons Have Seen the Stern of a Submarine Out of Water: This View Shows the Propellers, Rudder and Hydroplanes Which Somewhat Resemble the Elevators on an Airplane; This Particular Craft Is an English Submarine



At Left, Another View of the Stern, Showing the Striking Resemblance to an Airplane, the Hydroplanes Corresponding to the Elevators; Note Height of Rudder and Position of Propellers; Hull Is Like Fuselage of a Plane; Above, Looking through the Torpedo Tubes; a Rear Door Is Being Opened

HEAVY RIVER DEPOSITS CAUSE OF SOUTHERN EARTHQUAKE

Millions of tons of sediment deposited around the delta at the mouth of the Mississippi river, are believed by Dr. William Bowie, of the United States coast and geodetic survey, to have been responsible for the slight earthquake that shook New Orleans and vicinity not long ago. He explains that the earth is in a normal state of balance, the mountain ranges maintaining a state of equilibrium with the lower regions, usually of heavier materials. If soil is shifted in tremendous quantities and becomes centered in a comparatively restricted area, the earth seeks to restore the balance by movements of the strata. Such slight disturbances may be felt as earthquakes, and they are really blessings in disguise, for if the balance adjustment were not made in this fashion, a much more severe quake might occur later. Measurements made around the delta region and the Gulf of Mexico indicate that the territory normally is in a state of equilibrium.

HOME-ACCIDENT DEATHS TOTAL TWENTY-FOUR THOUSAND

Home is not as safe as it is popularly supposed to be. A survey made by a large insurance company shows that, last year, 24,000 persons lost their lives as a result of accidents in their homes. Falls were responsible for more than one-third of the accidents and one-half of the number of persons involved were elderly. Children's playthings caused a great number of the serious falls. Burns caused by stoves and scalding water, shocks from electricity, leaky gas and poisonous medicines, often improperly marked, also reaped a heavy death toll.

Typewriter Desk and Chair Mounted on Tubular Framework Which Increase Both Comfort and Efficiency

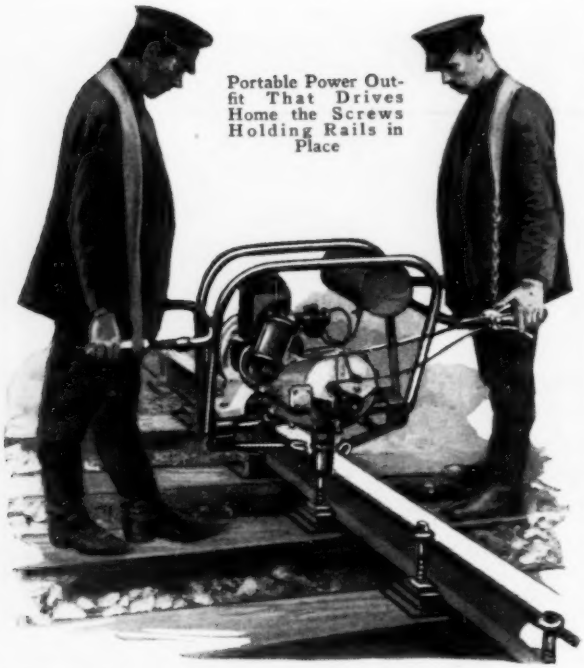
TYPEWRITER DESK AND CHAIR ON TUBULAR FRAMEWORK

Typewriter desks and chairs mounted on tubular frames now are being offered as the most modern in office equipment. The desks are nearly unbreakable, the chairs are mounted on one curved tubular frame and the entire equipment offers both comfort and efficiency. Despite the metal base, the desk is light in weight and is particularly useful in typing on a machine with a long carriage.

SOLDERING IRON AND TORCH COMBINED IN ONE

For building and repairing radio sets, mending leaky pans, and for many other tasks about the house and shop, a combination soldering iron and blowtorch saves extra equipment, space and labor. It burns gasoline and is safe and simple to adjust. The fuel cost is a fraction of a cent per hour.

Combination Soldering Iron and Blowtorch Which Burns Gasoline and Is Simple to Operate



Portable Power Outfit That Drives Home the Screws Holding Rails in Place

SCREWS ARE DRIVEN BY POWER IN LAYING RAILS

Portable power equipment is being produced in Germany for driving the screws that hold the rail plates to the sleepers in track construction. The outfit consists of a two-cycle gasoline engine, mounted in a steel tubing frame with handles for carrying, and weighs about ninety pounds. When a screw is driven home, which takes only ten seconds, the motor stops automatically, preventing damage to the screw or machine. Otherwise the motor is controlled through a flexible cable by a lever on one of the handlebars.

GOLFER AND ARCHER DEFEATED BY CASTER ON FAIRWAYS

To determine which sport required the most skill and accuracy, a seasoned golfer, a practiced archer and an experienced bait caster, each using his favorite implements, recently played five holes of golf over a regulation course in Vermont, the caster winning in this particular case. The golfer carried the usual paraphernalia for this sport, the archer was equipped with a bow of forty-two pounds' pull, and the caster had two rods, one with a four-ounce weight for work on the fairways, and another much lighter for the delicate task on the greens. A regulation bait-casting target was placed on each green beside the golf cup, and a nine-inch bull's-eye target for the archer. The five holes totaled 1,798 yards and the caster took twenty-five shots, or one over his par which had been established at twenty-four. The golfer had a score of twenty-two, two strokes over the par set for him, and the archer made a score of twenty, three over par.

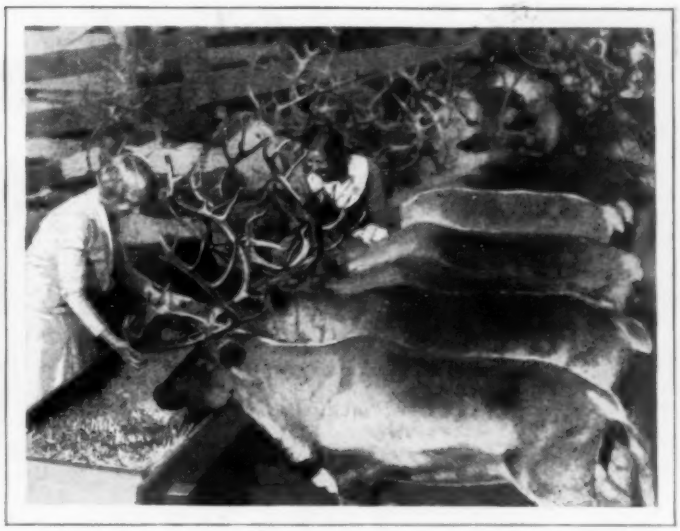
HARBOR OFFICE BUILT LIKE CYLINDER IS GLASS-INCLOSED

Designed along maritime lines, a cylindrical harbor office has been constructed at the new docks at Ymuiden in the Netherlands. The building looks like a series of cylinders piled on top of each other, the size decreasing as the stack grows taller. The circular building, with its various glass-inclosed levels, was found to be more efficient for the purpose than a structure of conventional design.

This Circular Building, Constructed along Maritime Lines, Is a Harbor Office in the Netherlands

WHAT MAKES THE BABY LAUGH?

Repetition of words or of an action not funny in itself, one of the favorite mirth provokers of the vaudeville comedian, will get a laugh from almost any six-months-old baby. A study of the first causes of laughter in infants, made by Dr. C. W. Valentine, professor in an English university, disclosed that delight in getting food was the first cause of laughter, the smile coming when the baby was thirty-nine days old. At ten weeks, babies laugh when they hear others laugh, or when tickled, and soon after laugh when they see a bright object. Surprise causes laughter at about eighteen weeks, and unusual happenings in connection with what is familiar, such as hearing the father speak in a falsetto voice, somewhat later. The laugh of accomplishment, such as standing alone, appears at about the time amusement is provoked by mere repetition.



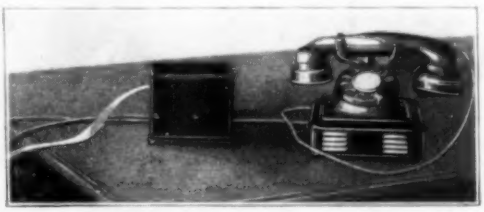
Herd of Reindeer on a Transcontinental Tour of the United States; the Animals Were Shipped from Alaska for the Holiday Season

ALASKAN REINDEER GO ON TOUR OF UNITED STATES

Visible proof that the Santa Claus of the present day has plenty of motive power is being offered to children of the United States in the form of a large herd of Alaskan reindeer which arrived in Seattle recently on the first lap of a transcontinental tour. The animals are to be used in eastern cities for Christmas publicity.

PHONE MESSAGE IS RECORDED FOR ABSENT OWNER

Telephone users in Belgium and Switzerland now may leave a message for the person called if he is absent when his telephone rings. The attachment which makes this possible is called a "telephonograph" and is a combination telephone and telegraph instrument on which the person calling, by means of a prearranged system of code, can signal a message to the absent party. This message is recorded on the automatic telegraph apparatus attached to the telephone, and is transcribed on a tape unrolling from the recorder. The absent person reads the message on the tape upon arriving home.



Apparatus Which Takes a Telephone Message on a Tape When the Party Called Is Absent

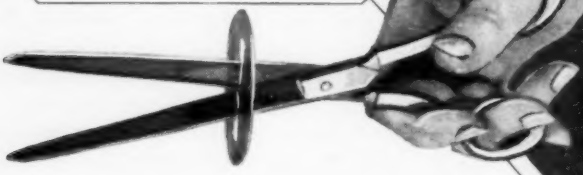
DRIED FRUIT HOLDS VITAMIN A

Dried fruit, even though sulphured and dipped in lye, retains large amounts of the important vitamin A, tests at the University of California have shown. Experiments with apricots, prunes and peaches proved that these fruits contain relatively large quantities of the vitamin, even though thoroughly dried. By feeding rats known to be deficient in the A vitamin, research workers found fruits dried by various methods showed different vitamin content. The sulphured dehydrated fruit appeared to retain the largest vitamin percentage.

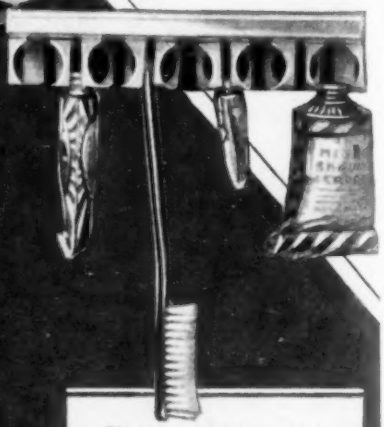
New Conveniences

Connected to the Gas Line, This Handy Incinerator Is Installed beneath the Range or in Any Other Convenient Place; It Radiates Practically No Heat, Does Not Emit Odors, and Is Safe and Economical

Puller and Turner for Hot Pans Prevents Burned Arms When Reaching into the Oven



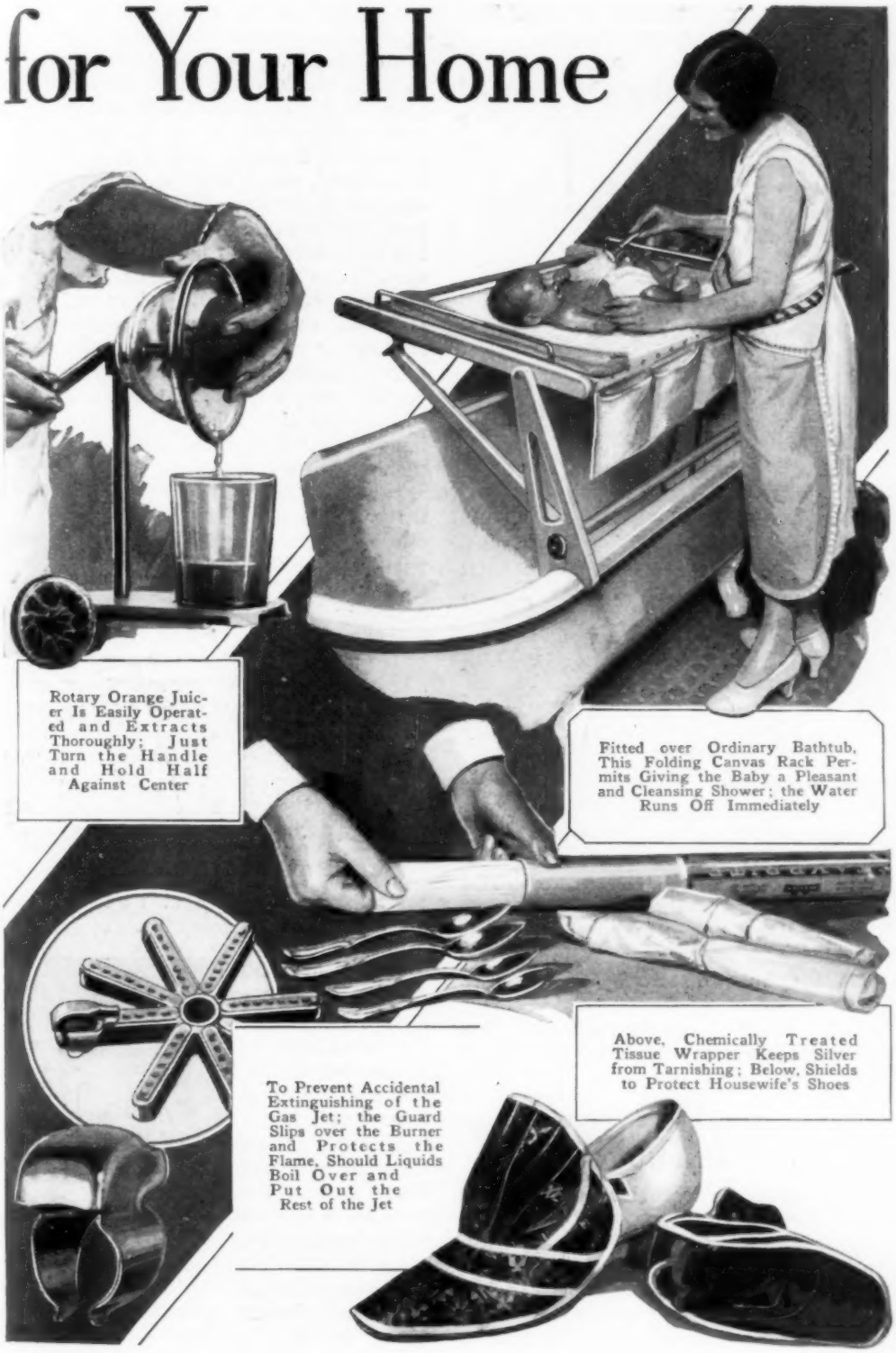
An Easy Way to Sharpen Scissors; the Tool Is Attached, as Shown, through the Narrow Slots, Then Pressed Hard against the Blades While They Are Closed as in Cutting; after Repeating Two or Three Times, the Scissors Are in Good Condition for Work



Here Is an Adjustable Metal Rack That Fits on Edge of Shelf in Medicine Cabinet for Toilet Articles Such as Shown

Combination Floor Mop and Polisher; Both Are Operated with the Same Handle, the Mop Part Being Removable as Illustrated; to Polish, the Mop and Handle Are Snapped in Place and the Entire Unit Moved About, the Polishing Being Done by the Broad Base of the Unit

for Your Home



Rotary Orange Juicer Is Easily Operated and Extracts Thoroughly; Just Turn the Handle and Hold Half Against Center

Fitted over Ordinary Bathtub, This Folding Canvas Rack Permits Giving the Baby a Pleasant and Cleansing Shower; the Water Runs Off Immediately

Above, Chemically Treated Tissue Wrapper Keeps Silver from Tarnishing; Below, Shields to Protect Housewife's Shoes

To Prevent Accidental Extinguishing of the Gas Jet; the Guard Slips over the Burner and Protects the Flame, Should Liquids Boil Over and Put Out the Rest of the Jet

MOVIE TOWER ON WHEELS SPEEDS UP PICTURES

A Tower on a Truck Used in the Movies for Quick Transportation and Elevation of Cameras

Moving-picture cameras and microphones for talking pictures are quickly transported from one location to another by one California movie company with the aid of an electric perambulator equipped with a hydraulic lift. The outfit looks like a tower on a truck, and is provided with platforms at various elevations for both directors and cameras. Cameras and microphones can be moved laterally and horizontally many feet in a few seconds, thus speeding up the filming of pictures.

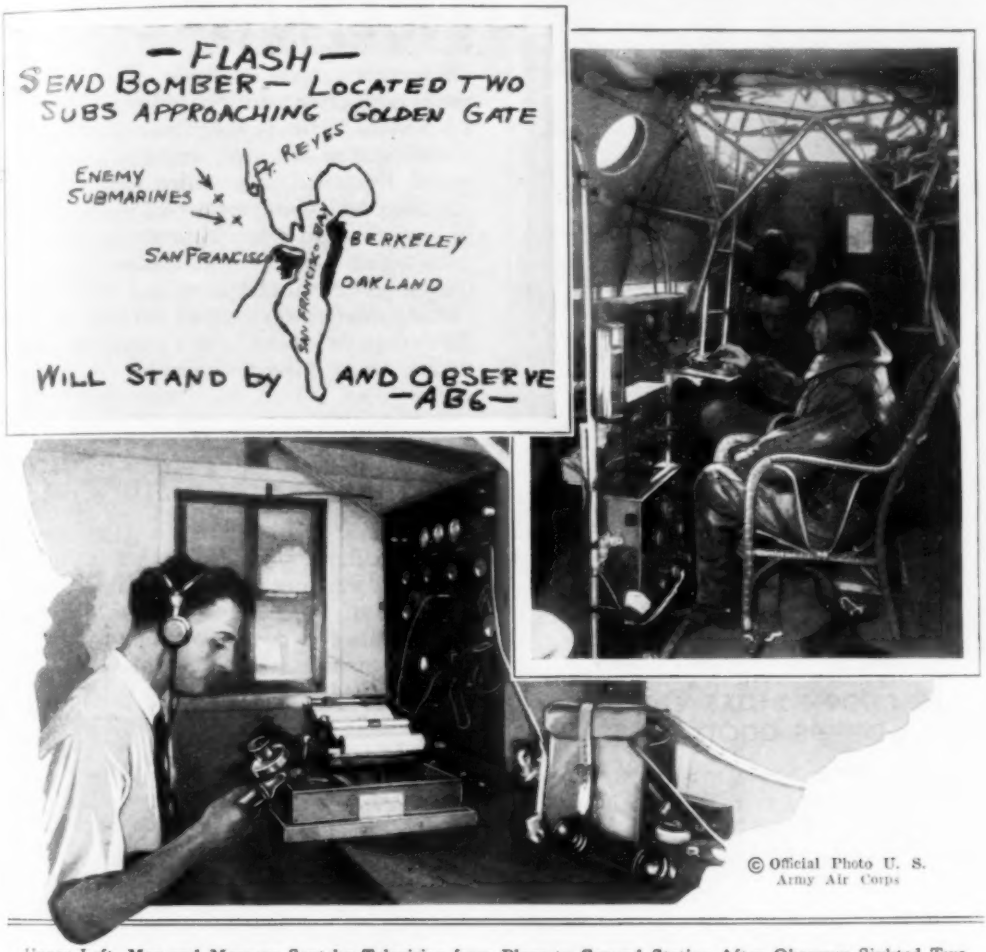
HARNESSING A LIVE VOLCANO FOR HEAT AND POWER

Live volcanoes in various parts of the world have been harnessed by man to furnish both heat and power. Steam jetting from fissures near the main crater of the famous Etna volcano in Sicily has been piped to heat an observatory near by, and efforts are being made to tap the energy for factory purposes. Near Florence, Italy, iron-incased shafts, 500 feet deep, have been sunk to tap a region of volcanic earth. The steam rushes up the pipes at high pressure and is conducted directly to turbines which operate electric generators supplying power to four cities. In Iceland, steam from a volcano which extends under the sea is used to supply heat, and in Chile and Bolivia, a company has been formed to harness a great volcano in the Andes mountains. The energy developed by the molten lava and steam is to be converted into electric power amounting to about 400,000,000 kilowatts to operate the mountain railways and silver and copper mines of the region. The steam from this volcano is so free from impurities that it can be run directly into turbines without installing costly cleaning apparatus. Passengers traveling by air from Singapore to Java pass directly over one small but active volcano which provides an awe-inspiring spectacle. Another volcano, Solfatara, near Naples, recently broke into flame and steam after 700 years of inactivity, and the authorities of the city tried to tap its energy through a large iron pipe, but found that the metal was corroded quickly. Efforts now are made to find a non-corrosive material so the city may use volcanic power to run its tramway system and light its streets.

ERASERS RUN BY ELECTRICITY USED IN PRINTING TRADE

For large drafting rooms and printing offices, a German manufacturer furnishes motor-driven erasers, suitable for pencil, india and printing inks. The motors are suspended from the ceiling, and from each issue two flexible cables, terminating at the lower end in the eraser fixture which contains a rounded conical head of soft or hard rubber. There is also a head containing both, so mounted that a twist of the hand brings one or the other in contact with the paper.

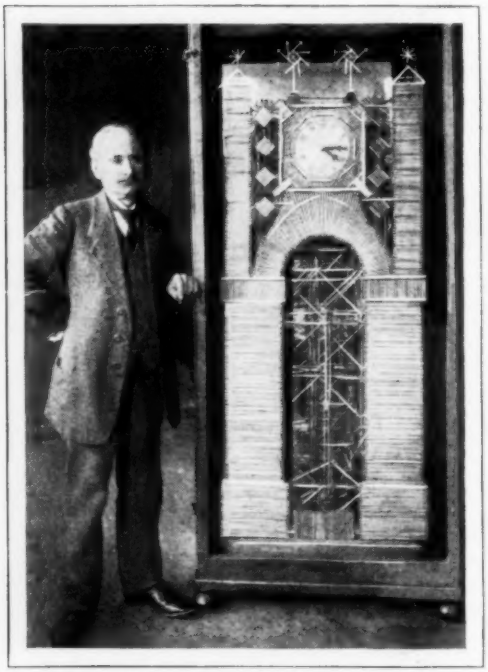
"WAR" PICTURES ARE SENT FROM A PLANE BY RADIO



Upper Left, Map and Message Sent by Television from Plane to Ground Station After Observer Sighted Two Submarines; Right, Radio Apparatus on Plane, and, Below, Receiving the Picture

Television pictures transmitted from an army observation plane were recently employed to locate and destroy theoretical enemy submarines intent on reaching the Golden Gate and San Francisco. The observation plane was sent out to find the "enemy" vessels, particularly submarines, known to be proceeding toward the harbor. The plane was equipped with a radio-television sending apparatus and was operating with a ground station far inland where army commanders worked on war maneuvers. The trained observer saw the telltale spear-head wake of two submarines on the water below, although the vessels were so deep that their periscopes were under water. The observer then made a sketch of the terrain below, showing San Francisco, the Golden Gate and the bay, and two crosses marking the position of the boats. On the map he printed a request for a bombing plane and then transmitted the sketch by television to the ground station, where the picture was handed to a bombing crew. The bombing plane was enabled to reach the scene and drop a hypothetical load of depth bombs before the boats had proceeded a mile.

¶Write our Bureau of Information if you wish to know who makes or sells any article described in this magazine. Send no postage; the service is free.



Clock Made of Straw Which Keeps Accurate Time; a German Spent Fifteen Years Building It

BIG CLOCK BUILT OF STRAW KEEPS GOOD TIME

Fashioned of straw, a large clock, constructed by a German artisan, is said to keep accurate time. The maker devoted his spare time over a period of fifteen years to the task.

AUTOMOBILE HAS SIX WHEELS AND TWELVE GEAR SHIFTS

Six wheels, six brakes, eight speeds forward and four reverse, five axles and no frame are features of an automobile built in Czechoslovakia of such unusual construction that one has been brought to this country for experimental purposes. It was originally made for the use of German army officers in crossing shell-torn ground. The car has four driving wheels that are designed to contact at all times with the most irregular contours, making the machine particularly useful in traveling bad roads or across sections where there are no roads. The twelve gear shifts offer a wide range of power and the maximum speed is about forty miles an hour. A horizontal air-cooled four-cylinder engine powers the car. It is built on a nine-inch tube which carries the propeller shaft. In line are the transmission and two differentials, one for each set of driving wheels. Each driving wheel has its individual axle, connected to the differential by a universal joint.

Six-Wheeled Auto for Traveling Rough Ground; It Has Five Axles, Eight Forward Speeds and Four Reverse

RADIO ICEBERG FINDER SOUGHT TO PROTECT SHIPS

Efforts are still being made to devise a practical iceberg finder that will give infallible warning to an ocean liner of the presence of the danger, and its direction and distance in plenty of time to change the course. Radio has been of some aid in preventing a repetition of a disaster such as sunk the "Titanic" eighteen years ago, but even this medium is not entirely successful. The coast-guard ice patrol, by means of radio, is able to warn vessels of the presence of icebergs it can locate, but no instrument has been found sufficiently practical to pay for its installation on liners themselves. Sounding apparatus has been made which will detect icebergs a mile or so distant, but such apparatus is not very successful because of the speed of modern ships and the lack of accuracy in measuring the distance. The development of the radio compass, or direction finder, however, would enable rescue ships to reach a boat in collision with a berg much more quickly than was possible at the time when the "Titanic" sank.

The VANISHING HERD

CLOUDS of dust hung over the ground and drifted higher as the thudding of thousands of hoofs in rapid motion traveled like thunder across the countryside.

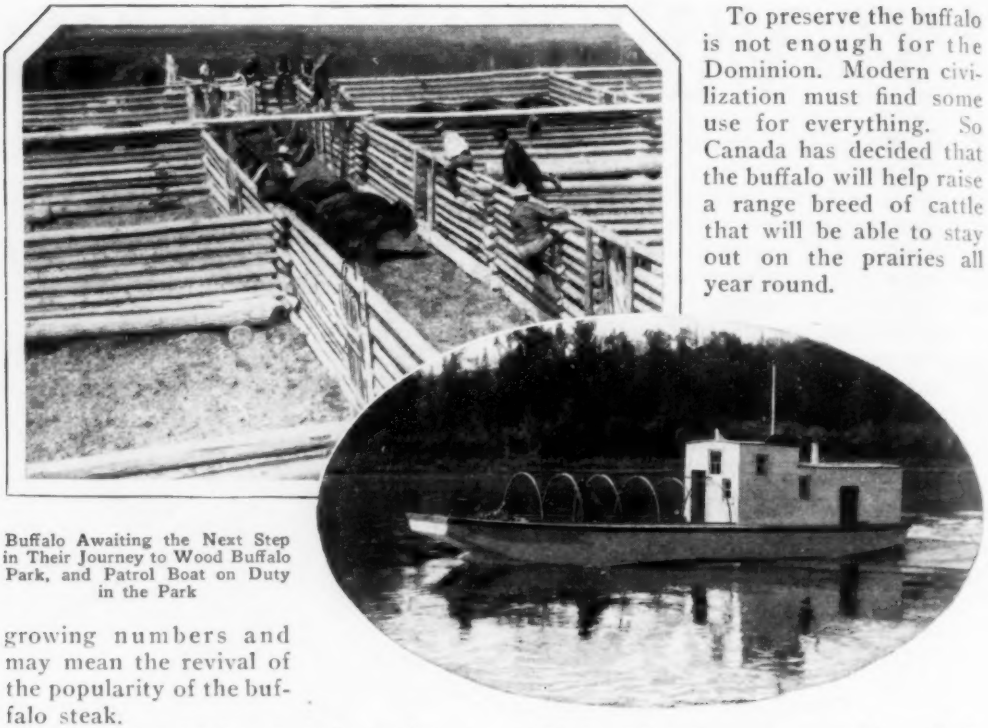
Far off, could be seen a black mass advancing rapidly. A pony dashed past, a lone cowboy in the saddle. Coming closer to the herd of stampeded animals could be seen more cowboys, racing alongside. The charging black mass kept on, its leaders headed off by the cowboys toward a wooden fence.

The occasion was not many years ago. The stampede took place this autumn, as it did last autumn. Canada's cowboys were rounding up the world's second largest herd of buffalo at Wainwright Park, in the rolling prairies of eastern Alberta, where from four to six thousand head roam in a pasturage of 100,000 acres.

Splendid Head of a Buffalo in National Park, at Wainwright, Alberta, and, Below, Herding the Animals into Wading Corral

The herd has grown from 709 animals which the Dominion bought in 1907. In fact, so large are the herds now that it has become necessary during the past few years to have an annual roundup. It occurs during the early autumn. Then scenes, such as were frequent not more than fifty years ago, become realities of today. The thousands of buffalo, fear-maddened into a stampede, are driven by expert cattlemen into the corrals. The calves are branded and the yearlings shipped to the largest game preserve on the continent, Wood Buffalo Park, at the boundary of the Northwest Territories and Alberta, which covers 17,000 square miles.

This novel undertaking of giving the former monarch of the plains his freedom again was begun in 1925, and has been continued yearly since, until now there are more than 10,000 animals, including those shipped north this autumn. The animals which used to roam in millions over the plains from the Gulf of Mexico to the Arctic shore, mercilessly shot almost to extinction, are coming back again in



Buffalo Awaiting the Next Step in Their Journey to Wood Buffalo Park, and Patrol Boat on Duty in the Park

To preserve the buffalo is not enough for the Dominion. Modern civilization must find some use for everything. So Canada has decided that the buffalo will help raise a range breed of cattle that will be able to stay out on the prairies all year round.

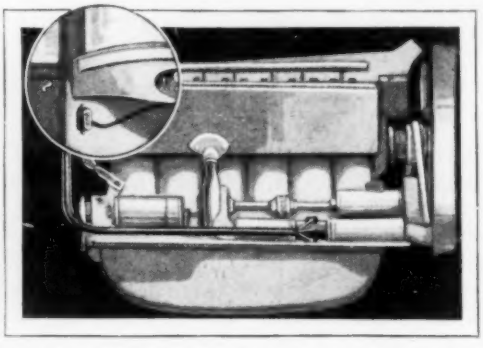
growing numbers and may mean the revival of the popularity of the buffalo steak.

As a matter of fact, buffalo steaks are already to be found in western Canadian restaurants as well as in some places in the adjoining states of this country in the autumn, when expert riflemen and fast-shooting rifles pick off the older members of the Wainwright herd. Buffalo robes and coats are also coming into style again as each year a number of these animals are slaughtered.

Little real progress was made until the yak, an animal from far away Thibet, was brought in as an intermediary. This beast seemed to be the link between the buffalo and domestic cattle. As soon as a product is obtainable from this triple ancestry, the effort will be made to breed out the yak blood. The "cattalo" produced in the latter experiments promise well; they have good coats and excellent flesh.

PREHEATER FOR AUTO ENGINE PLUGS INTO LIGHT SOCKET

Operating from a light socket in the garage, an electric preheater for the automobile engine keeps the motor above freezing in zero weather at "low heat," and on "high heat" will warm an engine to summer temperature in five or ten minutes. The heating element, which provides easy starting and saves batteries, slips into the lower hose connection, a cable extending from the unit to a switch installed in the door frame under the dash. It costs little to operate and can be installed in only a few minutes.



Showing Installation of Electric Preheater for Auto Engine Which Operates from Light Socket

¶Our Bureau of Information is for you; use it as often as you please.

ELECTRIC CABLE OF ALUMINUM REDUCES POWER LOSS

Aluminum wound over steel, has been used instead of copper in a 220,000-volt transmission line, 126 miles long, in the east. The cable is one and three-eighths inches in diameter but, despite its large size, weighs only one pound to the foot, and reduces power losses resulting from corona, the luminous discharges of energy commonly experienced with all high-voltage transmission lines.

RAILROAD CARS IN GAY COLORS PREVENT AUTO ACCIDENTS

To reduce the number of accidents resulting from automobiles crashing into the sides of railroad trains at crossings, the cars of the Canadian National railway have been painted in bright colors. The gay hues in contrasting shades are visible for a considerable distance. Self-propelled cars are also equipped with warning bells and whistles in addition to being painted in bright reds and yellows.

LATEST ARMY PLANES SUITED TO HIGH ALTITUDES

Latest fighting equipment of the United States army air forces includes 131 single-seater biplanes that are exceptionally speedy and powerful. These machines, fully loaded, weigh 2,700 pounds and can climb 33,000 feet without reaching their limit. The little craft can do better than 180 miles an hour.

One of Latest Type Army Fighting Planes, Capable of Reaching High Altitudes and with a Speed of Over 180 Miles an Hour

College Class in Radio Broadcasting Listening to a Student Announcer at the Microphone

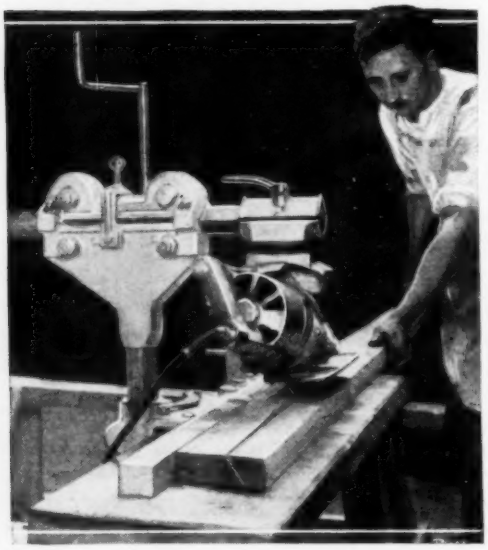
CLASS FOR RADIO ANNOUNCERS ENROLLS FIRST STUDENTS

Radio announcing this year made its debut as a college study when the University of Iowa enrolled students for a course in broadcasting. The class uses the school's radio station to train each individual in diction, quality of voice and other requisites of the efficient broadcaster.

RADIUM'S RAYS PIERCE STEEL TEN INCHES THICK

X-ray photographs of steel ten inches in thickness can now be obtained by the use of radium. With the usual X-ray equipment it has been impossible to penetrate steel more than four inches. The latest equipment, besides making it possible to examine thick steel girders and battleship hulls for defects, also offers advantages in portability and simplicity over the usual equipment. The method, which has been developed by the naval research laboratory, consists in trapping the gas which radium is continually giving off in a tube, surrounding the tube with glass and grouping the steel to be examined on the outside. The rays pass through the thick metal with sufficient strength to make usable photographs.

ARM FOR ELECTRIC HANDSAW IMPROVES QUALITY OF WORK



Radial Arm for Electric Handsaw Which Converts a Portable Outfit into a Handy Bench Unit

Designed to convert a portable electric handsaw into a table or bench unit, a radial arm now on the market fits almost any type and promotes greater accuracy and ease in many operations. The arm is provided with clamps and brackets for holding the saw, which is quickly adjusted; it reduces vibrations especially when cutting tile, building stone and other hard materials, and in mitering, beveling and similar tasks, the saw is securely locked against movements.

TUNNEL IN GRANITE TO REVEAL NEW BEAUTIES IN YOSEMITE

Travelers will be able to see the Yosemite valley from a new vantage point with the completion of a proposed 4,000-foot tunnel through the solid-granite valley wall, 500 feet above the bottom and beginning at a point about one and one-half miles from the Bridal Veil falls. It will emerge on the side of Black Turtle dome. The tunnel will be twenty-four feet wide, twenty feet high, electrically lighted and ventilated through openings in the side of the cliff and by means of the natural draft. In addition to the roadway for automobiles, there will be a footpath for hikers. Near Black Turtle dome, the roadway will be widened into a broad parapet from which a panoramic view over the valley may be enjoyed. The tunnel alone will cost about $400,000. It is part of a $2,000,000 reconstruction program which is expected to be finished for the season of 1932.

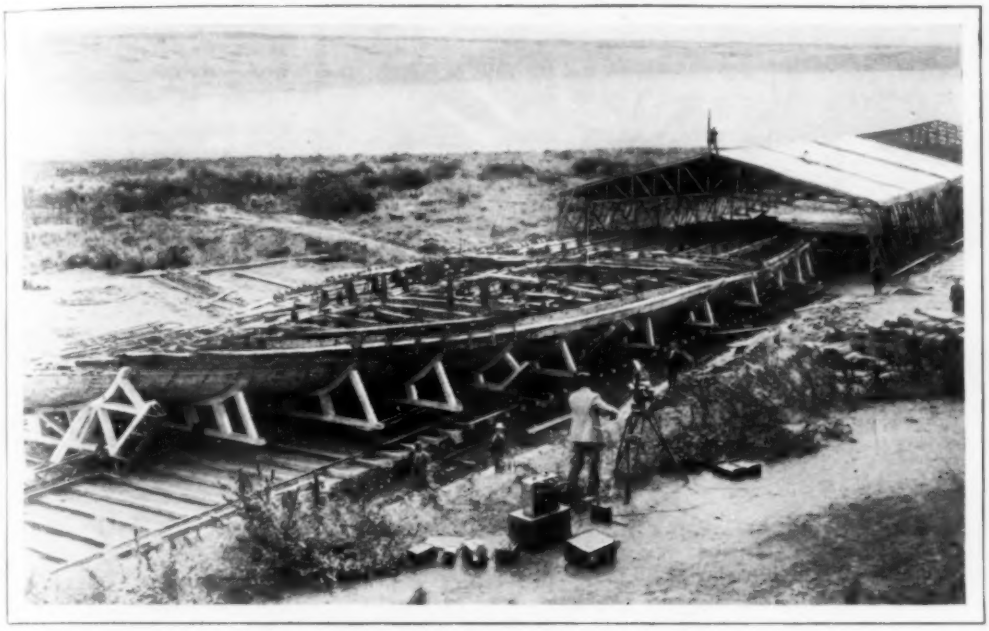
RECOIL CUSHION FOR SHOTGUN HELPS IMPROVE AIM

To take up the recoil of the shotgun, a special pad that protects the shoulder and arm, has been devised. It is easily attached to the gun and, having no slots or other obstructions, is claimed not to depress or elevate the muzzle. The outside is a solid-rubber cushion. Inside is a mass of spongy material of a special chemical compound to absorb the shock. The recoil is evenly dissipated, there are no holes or openings to collect dirt, and the shoulder surface cannot skid or slip.

CAMPERS' CUP HAS COMPASS MIRROR AND MAGNIFIER

For campers, hunters and others, a metal cup that has a compass and mirror on the bottom and a magnifying glass on the top, has been introduced. The unit is collapsible, weighs less than two ounces, and is made in aluminum or nickelplated brass. When extended, the cup is nearly three inches high.

Collapsible Drinking Cup for Campers That Contains a Compass, Mirror and Magnifying Glass



Ancient Roman Barge Which Once Was a Floating Palace of the Emperor Caligula; Lake Nemi, Where It Has Lain for 2,000 Years, Recently Was Pumped Out to Bring It to View

ANCIENT ROMAN BARGE RAISED AFTER TWENTY CENTURIES

After lying on the bottom of Lake Nemi in Italy for nearly 2,000 years, one of the barges of the Roman emperor Caligula has been exposed by pumping the water from the lake. The boat, some 200 feet long, was once a floating palace. The hull of the vessel is exceptionally well preserved. A shed is being built around the craft to protect it.

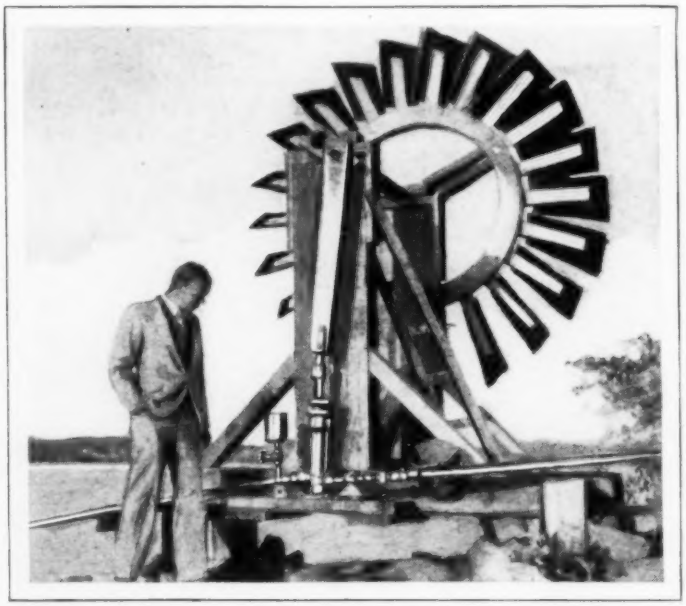
ALL-METAL BOWLING BALLS AS ELASTIC AS WOOD

All-metal bowling balls are being used in France, where they have been found to offer the elasticity, resistance to shock and balance that it had been thought could be found only in wood. Heretofore French bowlers have been using wooden balls covered with steel sheeting, the all-metal ones being produced by welding. Two hemispherical shells of thick, beaten-out sheet iron, symmetrically beveled, are welded together and the hollow interior is filled, through a small opening, with a substance of uniform density, and having an elasticity equal to that of wood. The opening then is closed with a pin, cut and riveted, and the ball is finished in a lathe and channeled, presenting an equilibrium considered by many to be superior to that of the wooden ball. The metal balls are of the same size and weight.

TIME FOR OIL CHANGE SHOWN ON GEAR-SHIFT LEVER

Visible warning of the mileage at which oil should be changed is given to the motorist in an oil meter which is an integral part of a crystal ball for the gear-shift lever. The ball makes sticking of tags on the speedometer unnecessary, as the meter is set, when oil is changed, to the figure when it is to be changed the next time. It is a sturdy instrument and has no parts likely to get out of order.

¶Twenty-nine cities now are equipped with police radio systems.



Breezes Furnish the Motive Power for This Wind Wheel Which Pumps Water from a Lake to the Home of a Family Living Near By

WIND WHEEL PUMPS WATER FOR SIX FAMILIES

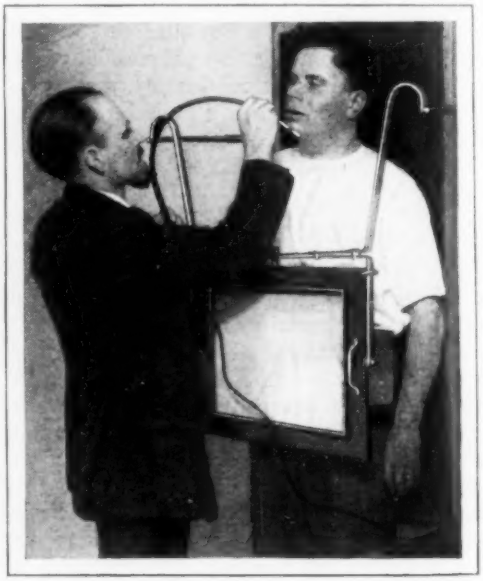
To replace a gasoline pump for drawing water from a lake to his home, a Minnesota man has made a pump that derives its power from the wind. It is similar in principle to the windmill pumps used on farms, the frame having been built from waste lumber pulled from the lake, while the blades are of coated metal. The little windmill revolves easily in even a slight breeze and is capable of pumping enough water to supply six average families.

STEEL TUBES FOR BOAT HULL CUT BUILDING COST

Steel tubing is being widely used for electrical conduits, airplane construction and other purposes, and now has proved its value in boat building. A western company has constructed a craft with a steel-tube hull for service on the Mississippi river. Approximately 500 feet of one-half-inch tubing were used, the members being joined by welding. The frame was then covered with sheet metal and all seams welded. An estimated saving of twenty-five per cent over wood on a production basis was possible by employing the tubes. Without passengers or freight, the boat draws only two inches of water and is claimed to attain a speed of fifty miles an hour with proper power.

STOMACH'S INSIDE IS PICTURED BY TINY CAMERA

Photographing the inside of the stomach is accomplished with a tiny camera, known as a "gastrophotor." It is about two inches long and is inserted while attached to a stomach pump. It has an upper and lower "eye," each provided with four films about an eighth of an inch square. Between the two is an electric bulb which gives a 12,000-candlepower cold light. It has no lenses, but uses pinhole exposures for making pictures after virtually being swallowed by the patient. An X-ray apparatus is employed to observe the position of the apparatus in the stomach.



Tiny Camera on the End of a Stomach Pump Which Takes Pictures of Interior of Stomach

A.C. TUBE CHECKER
SIMPLE TO MAKE

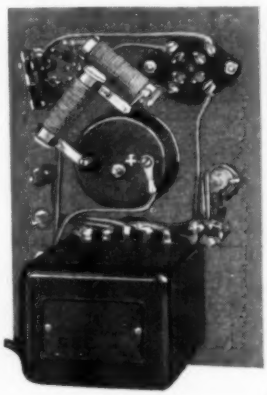
By D. A. Brown

AN alternating-current tube tester that can be built at a cost of about $10 will meet the need for an inexpensive portable checker, and many radio experimenters will have all the necessary parts on hand. It must be understood that an a.c. tube tester of this type cannot be adapted for testing screen-grid tubes without adding greatly to the cost of construction and a number of changes in design. On the other hand, the wide range of tubes that can be checked with this simple instrument embraces 226, 227, 171, 171-A, 112, 112-A, 201-A, 280, 281, 210, 250, and 213-types.

This list includes several tubes not usually provided for in many expensive a.c. checkers, and, although the test is not complete in every detail, it will enable the user to identify good or poor tubes very quickly and accurately.

An a.c. tube checker has the advantage that no batteries are necessary for its operation. The average checker, taking its filament-current supply from a storage battery, is not very satisfactory for testing tubes of the a.c. type. The current required for these tubes is high, and they take various voltages at different current ratings. Therefore, placing a resistor in the circuit of a battery-operated checker is not very good practice, as the voltage requires changing with different types of tubes whose current drain is too high to be furnished from a battery. In addition, it has the advantage of portability and may be placed in operation very quickly by merely plugging it into any outlet socket supplying 110 volts a.c.

The various parts are mounted on a bakelite panel, 3/16 by 6 by 8½ in. The four-prong and five-prong tube sockets are of the subpanel-mounting type. Two holes, 1 7/16 in. in diameter, for mounting these sockets are cut in the panel in the location shown. The 0-to-25 milliammeter, which is mounted directly below the sockets, requires a hole of a diameter which will depend on the type and make of meter used. The filament-heating transformer is a standard type with the various taps arranged to supply the voltages required. The two 500-ohm resistors are of the 2-in., 25-watt wire-wound type. They are connected as shown in Fig. 1, one resistor being shunted across the paralleled plate and grid terminals of the sockets and the other in series with the milliammeter and plate terminals. These resistors are supported clear of the panel and instruments to which they are connected by soldering the terminals of the shunt resistor directly to the plate of one socket and the grid of the other. The second 500-ohm resistor is connected to the plate end of the first with a suitable



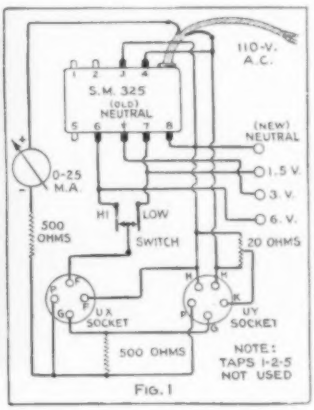


FIG. 1

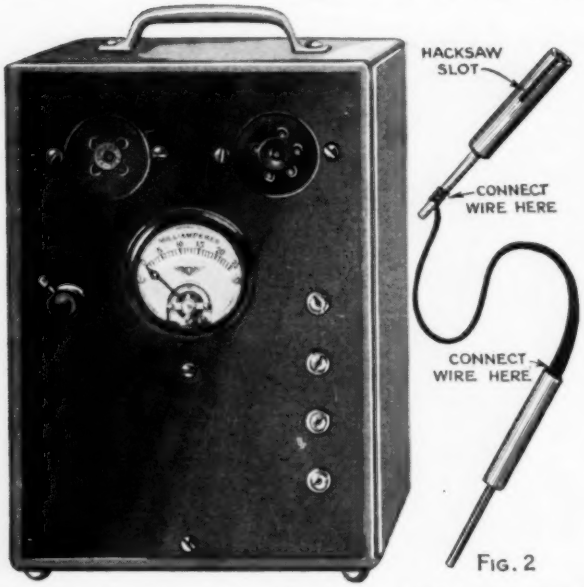


FIG. 2

length of busbar wire, the other end being connected directly to the negative side of the milliammeter.

The 20-ohm center-tapped resistor is connected directly across the heater terminals of the five-prong socket, the center point going to the cathode of this UY-socket. The switch is a standard type single-pole, double-throw, commonly used for changing from long to short antenna in present-day sets. It is employed to change the voltage on the UX-socket from 1.5 volts for the type-226 tube to from 5 to 6 volts for the 171, 210, 280, and other tubes, whose voltage ratings range from 5 to 7 volts. It is understood that some types of tubes will be operating under normal voltage ratings, but the checker will show a good reading to indicate a good tube.

The four midget cord-tip jacks, mounted along the side of the panel as shown in the photo, are to furnish current for tubes of the type having the heater terminals on the side or top, a further advantage not available in the usual tube checker. The connectors for testing tubes of this type are shown in Fig. 2, and are made by soldering flexible leads to phone tips or midget plugs. The flexible leads are about 6 in. long, and a hacksaw cut is made in one of the plugs on each connector so that they will fit tightly on the tube heater terminals. The only precaution to be taken when testing tubes of this type is to be sure to apply the voltage specified by the manufacturer; this, as a general rule, is 3 volts.

Mount the transformer near the end of the panel, as shown in the photo at the lower right on page 121, with the output terminals toward the milliammeter. The 110-volt a.c. supply lead to the primary of the transformer is tapped on each side for the lead to the milliammeter on one side and the lead to the heater terminal on the UY-socket and tap No. 4 on the other. The remaining heater connection is taken from tap No. 3. It will be noted that the neutral tap on the secondary of the transformer indicated as the "old neutral" now becomes the 3-volt terminal, and the neutral is shifted to tap No. 8. Taps Nos. 7 and 6 now supply the 1.5 and 6 volts respectively.

Rubber-insulated flexible hookup wire is used for all connections, and the completed tester may be mounted in a simple wood carrying case in the manner shown in the upper photo on this page.

To operate the tube checker, plug the cord in an a.c. lighting socket and note the type of tube to be tested. Tubes of the 226-type reading less than 15 milliamp. should be replaced. These tubes require 1.5 volts; therefore, be sure that the switch is thrown to the low side before inserting the tube in the socket. For all other tubes a reading of 15 milliamp. or more indicates a good tube; if less, the tube should be replaced. For the Kellogg or McCollough tubes, or similar

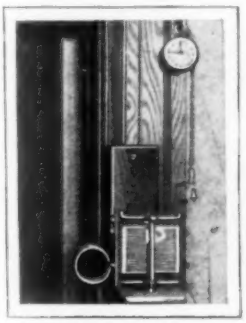
types having the heaters on the side or top, apply the heater voltage to the heater terminals from the pin jacks on the panel.

Operating A.C. Tubes

When a *226*-tube is used in an audio system, the transformer tap is not the best means of obtaining electrical balance in the filament circuit. A variable center-tapped resistance will give better results. The same resistance serves the like purpose also with the *227*-tube. Ground all transformer cases and cores and twist all filament leads, and bear in mind that grid-bias voltages are required on all a.c. tubes. The *226*-tube should not be employed as a detector, the *227* being the best for this use. When shunting a tapped resistor across the filament, for obtaining the best circuit balance to prevent hum, connect it directly at the tube-socket terminals.

Trap Reduces Short-Wave Interference

A simply built wave trap will reduce interference from near-by short-wave transmitters. A coil consisting of 4 turns of about No. 8 copper wire is wound on a form, 3 in. in diameter, and shunted across a .001-mfd. variable condenser. This device is mounted on the window, as shown in photo, and connected in the receiving antenna as a wave trap. It tuned to the offending wave when the plates were almost all in. Many signals could be copied, the writer found, and stations worked satisfactorily which previously could not be made out at all. The very high value of the capacity used is believed by the writer to be an important feature; when not required, the trap can be shunted out.—C. A. Briggs, Washington, D. C.



¶ For further information on any radio construction article write to the radio department; this service is free.

Dynamic Speaker with Double Air Column for Directional Public Address

Directional Speaker for Outdoor Use

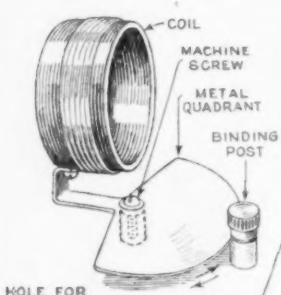
The directional air-column device adapted to the dynamic speaker shown in the photo was designed for the purpose of directing sales announcements and radio programs to cars approaching along a highway. The dynamic speaker is mounted on a sturdy support behind a small baffle and the extended wings at the rear are a part of the baffle. The double-horn arrangement may be made of sheet metal in the manner shown and decorated to suit the builder. Melvin Johnson, of Maywood, Calif., who originated the idea, is shown with the installation.

Photo-Electric Cell and Amplifier Unit

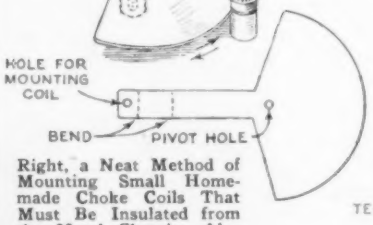
A unit that operates a relay when light falls on the photo-electric cell is now available. The cell, together with an amplifier tube, is mounted on an aluminum box which contains the necessary coupling devices and wiring. The unit responds to light influence in less than .001 second, and may be applied to many tasks which otherwise require tiresome watching by the human eye. These include the rapid counting or sorting of objects the shadow of which falls on the cell, the automatic ringing of alarms, and many similar uses.

HELPFUL RADIO

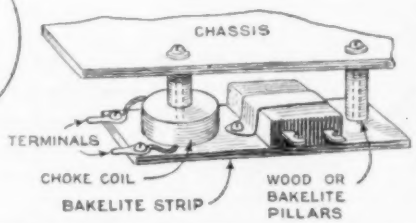
Top, Left, Rear View of New S-W Tuning Unit That Covers from 20 to 100 Meters without Changing Coils, Showing Small Variometer and Special Double Condenser Which Is Independently Tuned; Below, Control Panel with Belt and Pulleys; Right, Testing for Hum with 1-Mfd. Condenser across Plate-Voltage Taps Supplied by B-Eliminator; When Located, Condenser Is Permanently Connected



Left, a Simply Constructed Coupling Device for Coils Used in Oscillators, and Similar Devices, Where It Is Necessary to Obtain the Desired Degree of Coupling by Experiment; the Best Position Found, the Coil Is Locked in Place with the Binding Post; the Quadrant Is Cut from Scrap Aluminum and Drilled as Shown in Lower Sketch

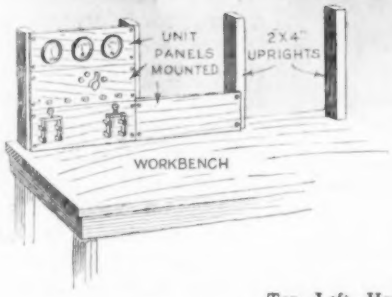


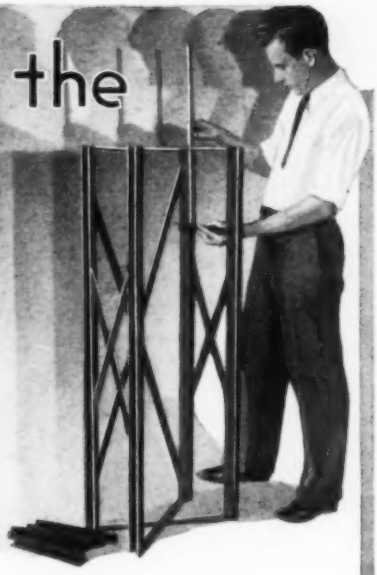
Right, a Neat Method of Mounting Small Home-made Choke Coils That Must Be Insulated from the Metal Chassis; Also Handy for Mounting By-Pass Condensers as Shown



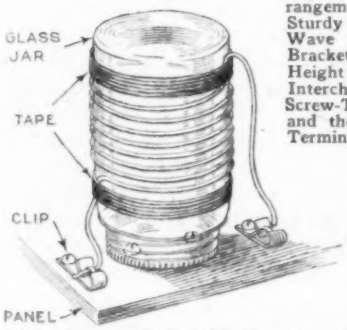
Above, with a Tapered Reamer, Small Holes Can Be Quickly Enlarged in Metal Bases; the Photo Shows an Aluminum Baking Pan Used for a B-Eliminator Base, the Holes Along the Side Being Enlarged to Pass Insulated Binding Posts

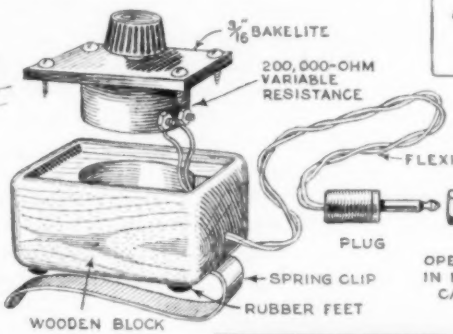
HINTS from the LAB.

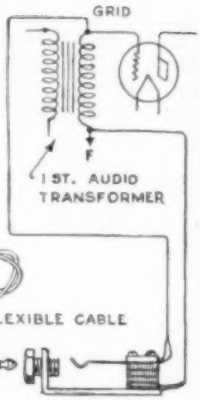




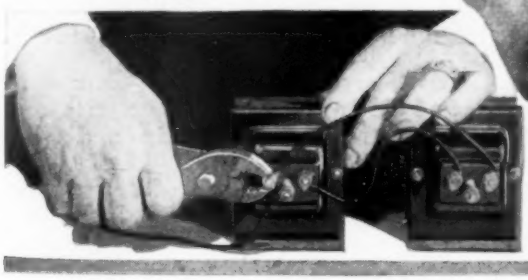
Top, Left, Handy Instrument-Panel Mounting Arrangement for the Workbench; Right, Building a Sturdy Channel and Strap-Iron Rack for a Short-Wave Transmitter of Unit Design; Angle-Iron Brackets Support the Shelves at Any Desired Height; Lower Left, a Simple Method of Making Interchangeable Choke Coils, Mayonnaise Jars or Screw-Top Glass Vials Supplying the Winding Form and the Screw Cap a Permanent Base; the Coil Terminals Are Brought Down to Fahnestock Clips







Right, Homemade Portable Remote Control; When in Use, Regular Volume Control on Set Is Turned Full On; Below, Connecting Filament-Heating Transformers in Parallel to Obtain the Added Current Necessary to Supply More Tubes Than One Transformer Can Handle; When Connected, Place a Three-Volt Flashlight Bulb across the Output and Insert Both Line Plugs; If Bulb Lights, the Secondaries Are Correctly Poled, If Not, Reverse One Plug; When Correctly Poled Connect Both Input Leads to One Plug and Take Center Tap from Added Transformer



To Reduce Hum Picked Up by Long Filament Leads in A.C. Sets, Twist in Third Wire and Ground to Chassis

Right, Rear View Showing Method of Mounting Receiver and Speaker; Center, Cutting Speaker Grill with Hacksaw; Left, Completed Installation

Closet-Door Radio Installation

The problem of room for the radio receiver in an apartment often tests the ingenuity of the tenant. One radio fan solved the problem by installing the outfit on a door. If the owner of the building objects to mutilating the door panel, it may be temporarily removed and a piece of ply wood substituted, which is stained or painted to correspond. The speaker grill may be cut in the panel. When the grill is completed it should be backed with gold cloth pasted on the back of the panel. For those who would not care to cut an ornamental grill, a square section of the panel may be cut out and covered at front with either a picture or a decorative tapestry. A pair of shelf brackets support the receiver shelf at the rear as shown. Holes are now drilled for the shafts of the various receiver controls as well as an opening for the dial escutcheon at the proper height. These holes must be accurately located before the door panel is drilled. In this case, the speaker was screwed directly to the door panel at the rear, but sometimes it may be necessary to make a small shelf for the speaker. In either case, the door panel will provide an excellent baffle. If there is no light socket available in the closet for the operation of the set, a small hole should be drilled near the base of the door so as to pass the cord to a baseboard outlet in the room. The antenna and ground connections can be made in the same manner.

Lacquer for Radio Use

Clear lacquer is useful for coating coils, cementing the turns together and holding them securely. By winding a coil on a cardboard form, giving it a coat of lacquer and then stripping out the form and applying a coat to the inside, a good substantial self-supporting low-loss coil is achieved. The same material can also be used for "doping" linen diaphragm speakers, thinning it out as may be required, and as a cement for securing the edges of speaker cones. While busbar type of wiring has failed to retain its popularity against the insulated straight-line style, busbars are still occasionally useful for special circuits. Lacquer, either clear or colored, can be used for insulating and identifying busbar circuits. Summing up, a small can of lacquer will form a useful addition to the radio workbench.

A Homemade Interference Arrester

To stop interference at the power line as far as possible from the receiver, is important, as the noise reduction in the speaker depends entirely upon this distance. A serviceable device for this purpose consists of two r.f. chokes wound of 5 lb. of No. 10 s.c.c. enameled wire each, in coils 2 in. thick and about 7 in. in diameter. These chokes are used in series, one in each side of the line. One terminal of each is connected to the main, and the other to the service wires. A pair of high-voltage condensers of .25-mfd. capacity, or larger, are connected in series across the line on the main side, with their mid-point grounded. This device should be inclosed in a rainproof metal can of ample proportions. In many cases this device will cut out as much as 60 per cent of power-line noises.

SIMPLE UNIT SUPPLIES WELL-FILTERED HIGH POWER

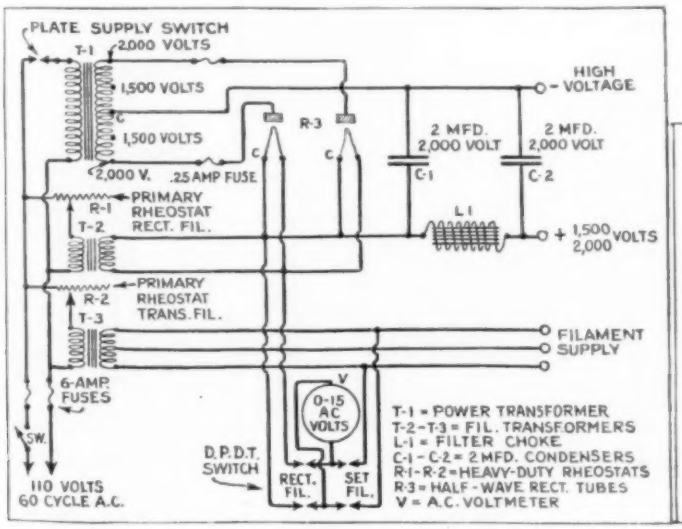
By FRANK L. BRITTIN

DETAILED information regarding the construction of a practical and inexpensive source of pure d.c. at high voltage has been rather difficult for the experimenter to obtain, and since the Federal Radio Commission has ruled out raw and poorly filtered d.c., it becomes necessary that experimenters and radio amateurs understand just what is required. This information in simplified form is now available to all in the unit to be described.

From time to time various well-filtered low-power units have been described, such as the power supply for the low-power "S-W Transmitter for Beginners" that appeared in the June, 1930, issue as well as a number of well-designed B-eliminators. It is commonly known that a B-eliminator must be well filtered or the results obtained on a broadcast receiver will not be up to standard. A good B-eliminator provides an excellent source of plate supply for small S-W transmitters for that reason.

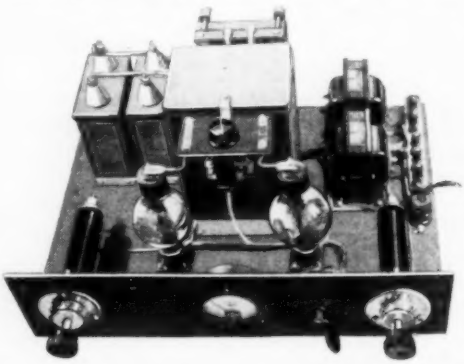
The high-power unit described in this article is merely a grown-up B-eliminator useful as a source of pure d.c. for advanced types of amateur S-W transmitters, public-address amplifier supply, and any service where a small d.c. current at high voltage is required.

No attempt has been made to assemble it in the compact form common to B-eliminators. Plenty of room is provided between the various parts, which are arranged on a breadboard layout, to insure good ventilation and cool operation. An output of



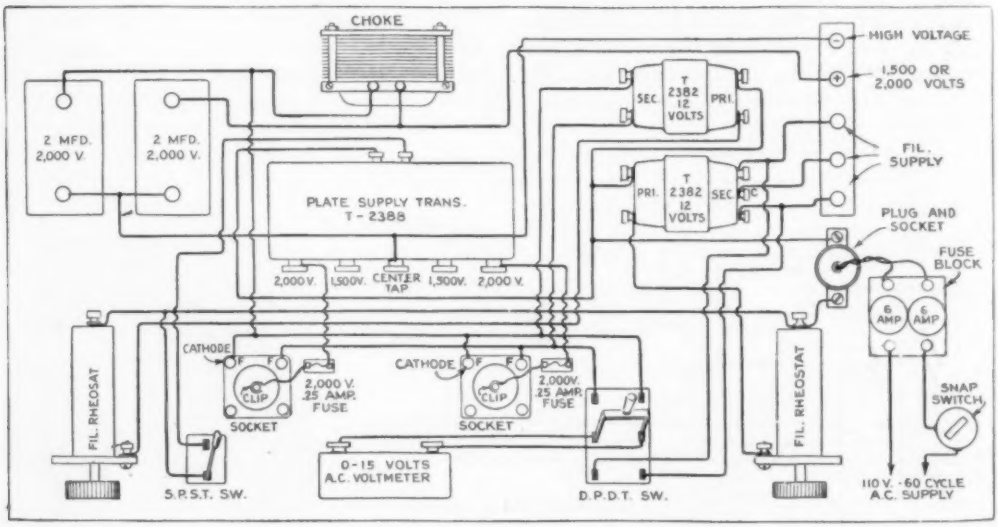
either 1,500 or 2,000 volts pure d.c. is available by merely shifting the taps on the power transformer, providing an unusually flexible source of supply. The filament voltage for the rectifier tubes, and any other tubes to be supplied, is also adjustable by means of the heavy-duty filament rheostats mounted at each end of the front panel. These voltages are easily checked with the double-pole, double-throw switch and a.c. voltmeter, which may be quickly thrown across the secondaries of either of the filament-heating transformers.

With a 30-henry, 300-milliamp. choke, the unit delivers 2,000 volts at 400 watts, and the current available is 200 milliamp. This is sufficient for the operation of a ¼-kw. tube or to run a 50-watt speech amplifier and oscillator. Enlarged diagrams and a detailed material list are available to all.



The instruments are assembled on a ¾ by 16 by 21-in. baseboard as shown in the photo on this page. The simplified wiring diagram is given directly below this photo and the on page 127 for those who prefer it to the simplified form. The photo at the right shows a close-up of the two half-wave rectifier tubes. These tubes are rated up to 3,000 volts, 1.7 amp. filament current; 250 milliamp. normal; and 10 volts are required for the filament. However, any half-wave rectifier tubes of similar rating may be used, such as 566 or 866. The tubes used in this model are connected with the filaments in parallel, and the lead to the filter or positive-plate lead is hooked to the filament, so that the tube-filament pins indicated as cathode are used for this lead. The cathode pin is indicated on the base of each rectifier tube with an arrow; the .25-amp. fuses indicated are supplied with these tubes. The center tap on the filament-heating transformer, supplying these tubes, is not used.

The bakelite front panel is 3/16 by 5¼ by 21 in. in dimensions, and an additional bakelite strip is mounted above the baseboard for the five large binding posts at the right. The 6-amp. fuse block and snap



parts are arranged as nearly as possible in their actual positions on the baseboard. The schematic circuit diagram is given switch, shown in the simplified wiring diagram, are not mounted on the baseboard, but should be placed at a conven-

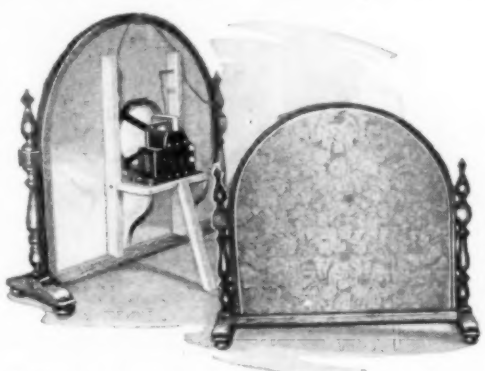
ient point near the unit. The single-pole, single-throw switch is used to turn on the plate supply after the rectifier tubes are well heated. During operation periods, the rectifier tubes should be left lighted, and the plate-supply switch should be turned on and off as required.

Saving Time in Tube Boosting

Tubes of the 199 or 201-A type may be boosted in groups of three or four at a time, if a multiple gang of sockets is available. Wire the terminals of all the positive and negative A-leads together. Solder the paralleled filaments to flexible leads terminating in a plug made from a discarded tube base, and insert the plug in the tube-booster socket. This will enable you to pep up as many tubes at one time as the gang sockets will hold.

Dynamic Baffle Resembles Fireplace Screen

To realize the full possibilities of a good dynamic speaker it is necessary to have a fairly large baffle, which also harmonizes with the home furnishings. I designed the illustrated baffle to meet these conditions. The board proper is made of two-ply celotex covered with tapestry, and the frame is designed to resemble a fireplace screen. The baffle may be decorated in oils or covered with wallpaper, but the tapestry selected conformed best with the color scheme of my living room. Another advantage of the tapestry was that it could be used to cover the baffle hole cut for the speaker without interfering with the operation of the instrument. The framework is of American walnut and is suggestive of the English influence in design. The molding, worked into the circular frame, was all done by hand. The baffle is 3 ft. high and 3 ft. wide. The construction of the shelf for the speaker is very simple.—H. G. Schif, Colorado Springs, Colo.

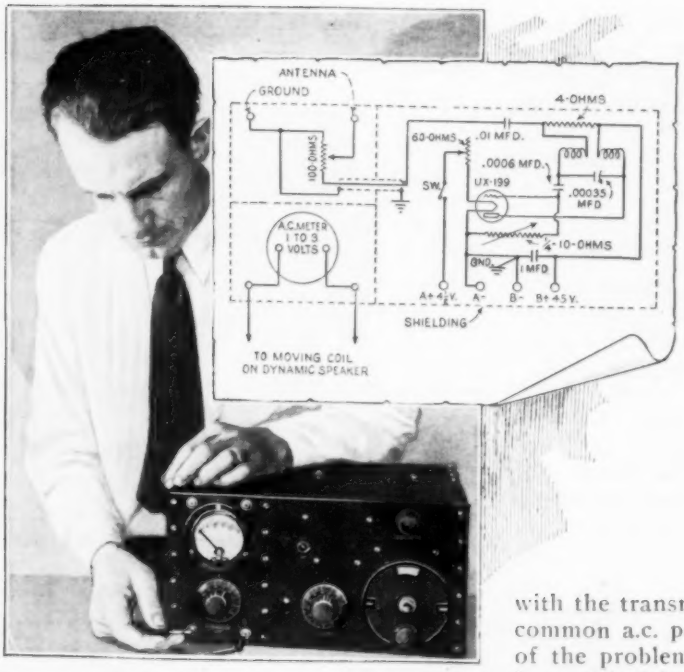


Front and Rear Views of Homemade Dynamic-Speaker Baffle

An Experimental Underground Antenna

Right, Coil Wound on Pickle Bottle; Left, Completed Assembly

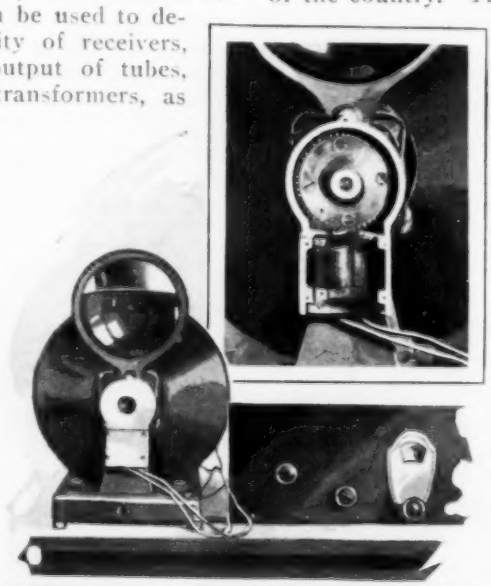
The underground antenna is not a new idea, a number of varieties having been offered to the public, some of which worked about as well as an ordinary overhead antenna while others were great disappointments. However, there is still a wide interest in the subject and, in some cases where local interference proves difficult to overcome with ordinary means, the set owner is willing to try out anything that may prove helpful. The underground antenna shown in the photo is simple to make and install. It consists of a number of turns of insulated wire, wound around a pickle bottle in the form of a coil. This bottle is placed inside a quart fruit jar. Insulated wire, preferably of a shielded type, is used as a lead-in, and the jar is then buried in wet earth. The writer has obtained good results in overcoming local interference. If a pickle bottle of suitable size is not available, a length of fiber tubing may be utilized instead. Sometimes it is best to disconnect the ground wire from the receiver when using the device.—Bernard L. Kobel, Frankfort, Ind.



Connecting Voice Coil of Speaker across Output Meter; Above, Schematic Circuit Diagram

Portable Signal Generator

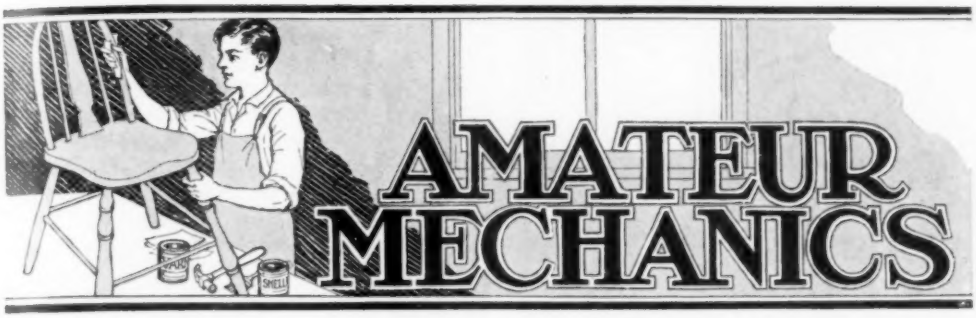
The shielded signal generator shown in the accompanying photo has been designed to enable dealers and service men to check and aline ganged condensers accurately. It also can be used to determine the sensitivity of receivers, and to check the output of tubes, speakers or audio transformers, as well as to check the calibration of any set. The oscillator consists of an r.f. generator operating over a range of 550 to 1,500 kilocycles; a 199-tube is used and means are provided to modulate the output of the oscillator over the required musical range. In the lower section of this shielded compartment there is space for the necessary batteries. A fractional part of the output of the oscillator is tapped off, and by means of a shielded cable, this output is carried over into the attenuator compartment. This output may be varied to suit the requirements. The meter, connected across the voice coil of the speaker, indicates the output in volts. The meter can also be used for measuring low a.c. voltages, such as the filament voltages of tubes.



Synchronizing Device, with Cover Removed to Show Mechanism, and Televisor Connected to S-W Receiver

Keeping Television Receiver in Step

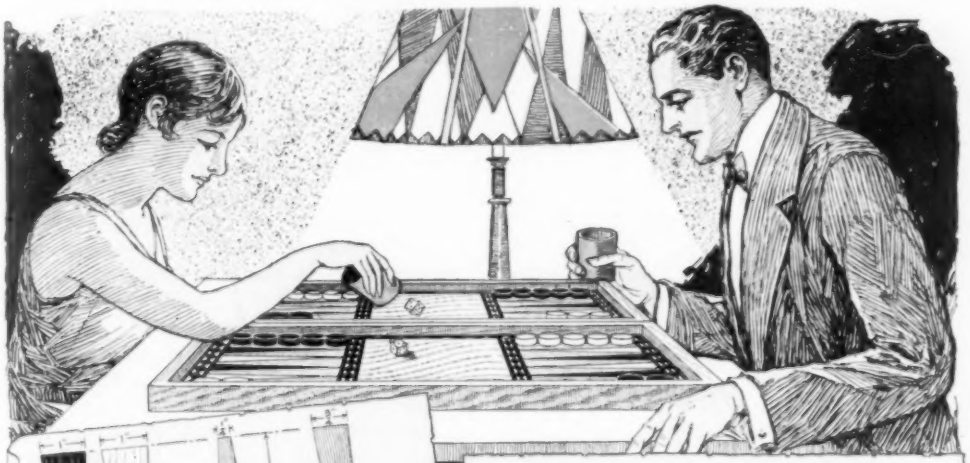
To keep the television receiver in perfect step with the transmitter without regard for a common a.c. power system has been one of the problems in the way of practical home television. The manual method of obtaining and maintaining synchronism is obviously unsatisfactory. The synchronous motor method, whereby an a.c. power system, common to both receiver and transmitter, is used, is most effective, but unfortunately is not available in all parts of the country. The device used in connection with the small televisor shown in the photos automatically synchronizes the receiving end with the transmitter by means of the usual radiovision signal. It takes the form of a small attachment that fits on the front bracket and scanning-disk shaft. An extra synchronizing amplifier is necessary in the receiver to supply the 720-cycle energy to drive the device. The synchronizer speeds up or retards the motor, acting as a governor.



Inlaid Backgammon Board Easy to Make

THE OLD GAME of backgammon has returned to favor, and bids fair to supplant bridge in the hearts of many devotees. The inlaid book-type board, described in this article, should make a hit with any backgammon fan, and is comparatively easy to make, since, contrary to most inlaid jobs, the construction entirely eliminates the necessity of routing.

The first step in making the board is to cut 12 pieces each from holly and ebony, to the dimensions shown in Fig. 1, with the grain running lengthwise of the points, as they are called. A simple method of cutting these points on the power saw is shown in Fig. 2. Tilt the crosscut guide



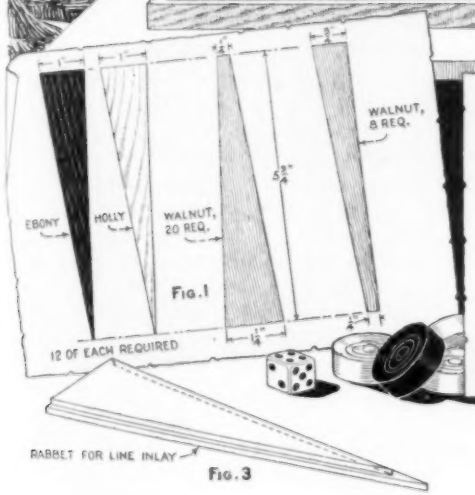
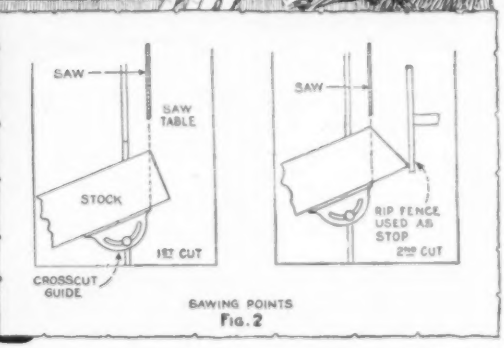


FIG. 1

FIG. 3



SAWING POINTS
FIG. 2

to the angle required to cut one side of the point, then saw off the end of the stock as shown in the first-cut drawing. Turn

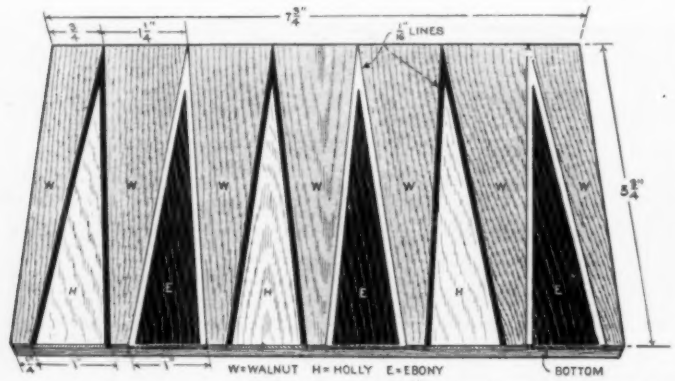


Fig. 4

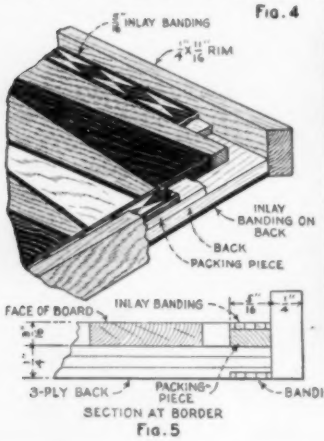


Fig. 5

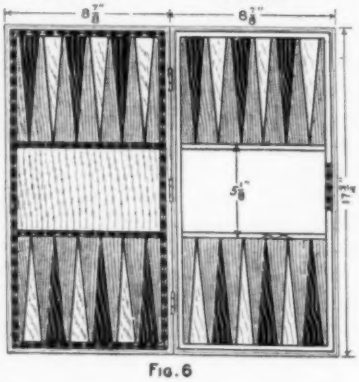


Fig. 6

piece of ¼-in. walnut. Before assembling, run a 5/16-in. rabbet right around the outer edge of this piece, on the walnut side, if three-ply is used, or on what will be the underside if solid stuff. This rabbet, when the rim is applied, forms the groove for the 5/16-in. inlay banding shown in the back view, Fig. 8, and in section, Fig. 5. One assembly of points is glued down at each end of the bottom board, 5/16 in. from the end, and then the centerpiece, shown in Fig. 7, is glued between them, the rabbets at each end of this piece also automatically forming grooves for inlay banding. It will be noticed, in Fig. 6, that a holly point on one end of the board is assembled opposite an ebony point on the other end, and so on across the board. Notice also, in the same drawing, that the alternate arrangement of the points is carried out across the other section of the board. When assembling, use good glue, and be careful that none of the pieces slip when clamped. When dry, glue in the white and black lines, being careful to get close joints at the apex of each point, then glue in the inlay-banding edging and the banding strips across the face of the board. It is well to have all the lining and inlay banding on hand before starting the job, so that the rabbets can be cut to suit the thickness of the stock, which varies a trifle now and then. When fitting the banding to the edges of the boards, try to match the pattern at the mitered corners as closely as possible. Scrape and sand each inlaid surface level and smooth.

Turn the board over, and glue and brad on the ¼ by 11/16-in. walnut rim, keeping the bottom edge of the rim level with the center of the board, thus forming the groove for the banding on the back, and mitering the corners as indicated in Fig. 8. Glue in the banding on the back, Fig.

the stock over and adjust the rip fence, with the long point of the stock against it, until the length of the point base, when cut, will be exactly 1 in., then make the second cut as shown. To cut off another point exactly similar to the first, merely turn the stock over and cut again. By this means all the points are cut exactly alike. The walnut pieces that go between the points on the board are cut in a similar manner, to the dimensions given in Fig. 1.

After cutting, the holly and ebony points are rabbeted on the edges, as shown in Fig. 3, to take the 1/16-in. celluloid "white-line" and "black-line" inlay bandings sold by marquetry-supply houses. It will be seen that when the points are assembled on a base, with the walnut triangles between, as shown in Fig. 4, the rabbets on the edges of the points form grooves to take the white and black lines, without any routing.

The backing on which the pieces are glued down may be a piece of three-ply, one side walnut, 8⅜ by 17¼-in., or a solid

8; then sand and scrape the surface of the board, banding and rim down to a level surface. The other section of the board is assembled in a similar manner, and then the two sections are hinged together, and the rims fitted, if necessary, so that they close with a good joint. Remove the hinges for finishing the pieces.

There is enough distinction between the woods used in the design for the wood to be finished natural, to prevent trouble in staining. Apply one coat of thin shellac, allow it to dry; then two coats of good cabinet varnish, rubbed down between coats, will provide a good finish. For a rubbed finish, give a coat of rubbing varnish, allow it to dry at least 48 hours, then rub, in one direction, with fine pumice powder and rubbing oil on a thick felt, using a rubbing brush in the corners. Rub just enough to take the gloss off, wipe clean, and apply another coat. Rub this down as before, then repolish with rottenstone and oil.

If you want the walnut portions of the board darker than the natural finish, it will be necessary to go over all the inlaid bandings, the holly and the ebony with shellac, applied with a fine brush, and allow it to dry, so that the stain used on the walnut will not affect the other woods. After staining, apply a coat of shellac all over, allow this to dry, and then proceed with the varnishing as described above.

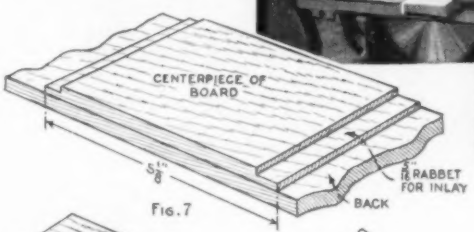


FIG. 7

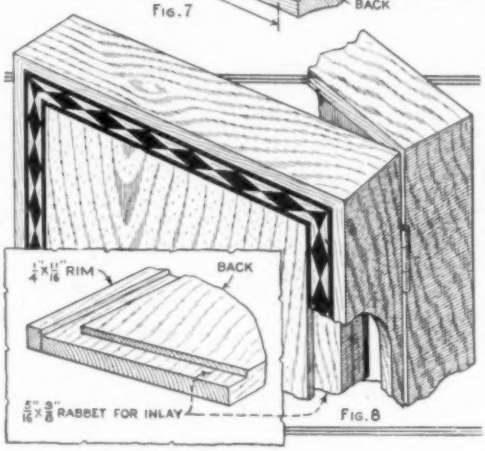
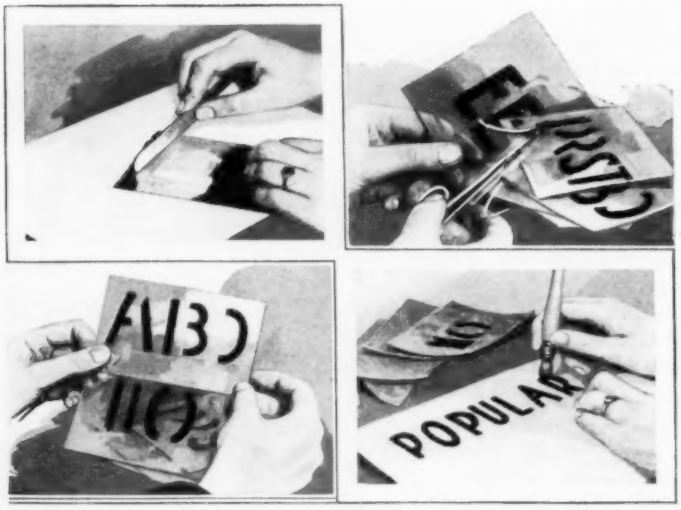


FIG. 8

Guard for the Violin Bout

Proper bowing, when playing a violin, is an art acquired only after considerable practice. The greatest trouble lies in the student's inability to draw the bow at right angles to the strings. Failure to do this results in the bow striking the right bout of the violin instead of clearing it. The friction of the rosined bow hair leaves a deposit of rosin on the edge of the bout, which accumulates very rapidly with every misjudged stroke. In time, the edge of the bout becomes worn, begins to roughen and finally splinters. Besides defacing the violin, the hair of the bow catches on the splintered edge, resulting in broken bow hair and an increased mutilation of the edge of the bout. A violin, at all valuable, should be protected against this abuse. A strip of adhesive tape, fastened to the edge of the bow, is the solution, and does not affect the tone of the instrument. When soiled, the tape is removed, and the edge of the bout cleaned with any of the preparations sold for cleaning stringed instruments. Do not steam the tape or apply hot water, as such practice will soon ruin the varnished surface.—Henry B. O'Connell, West Haven, Conn.



Letter Stencils Can Be Made of Ordinary Cut Films by Scraping Off Emulsion, Outlining Letters on the Film, Then Cutting Out as Shown

Stencils Made from Cut Films

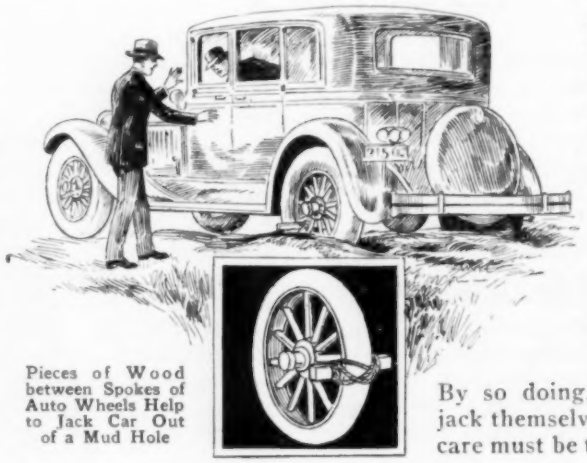
With the lettering stencils shown in the photos, anyone can make good-looking show cards and signs in much less time than would be necessary by the usual freehand method. First, get some old cut films from a photographer. Soak them in hot water to which a little washing soda has been added. After the emulsion has softened, lay the films on a smooth surface and scrape off the emulsion with a knife, after which the film should be dried. Cut letters of the desired size from a newspaper or magazine, or scratch the outlines freehand on the films. Then, with a pair of small scissors, cut out the letters. In the case of certain letters, such as A, B, D, O, P, Q and R, it is necessary to leave connecting links between the parts so that the entire letter will not be cut out. The lettering itself is done with oil or water colors, sparingly applied with a short-bristled brush. A ruler or guide line is used to keep the letters uniform, and the spacing should be kept the same.

Shellac Keeps Insects from Book Covers

Every year thousands of dollars worth of books are destroyed, or their appearance marred, because two kinds of insects, roaches and silver fish, have a decided liking for the starch used in ordinary cloth bindings. A simple treatment will protect them against these marauders, which are particularly troublesome in warm climates. Get some ready-prepared white shellac and dilute three parts of it with one part of wood alcohol. Apply this to cloth covers with a soft brush, but do not use the solution on leather bindings as they are damaged by it. If you have trouble from molds, add one 5-gr. tablet of bichloride of mercury to 1 pt. of the dilute shellac. This mixture is, of course, poisonous and should be so labeled.

Jacking the Car Out of Mud

One of the simplest methods of getting a car out of a mud hole, which does not require the use of anything that cannot readily be obtained when in such an emergency, is shown in the drawing. Get two pieces of wood, about 2½ ft. long, and slip them between the spokes of each rear wheel as indicated, tying them in place if some rope is available. Then shift into gear and start slowly. By so doing, the wheels will jack themselves out. Of course, care must be taken not to move



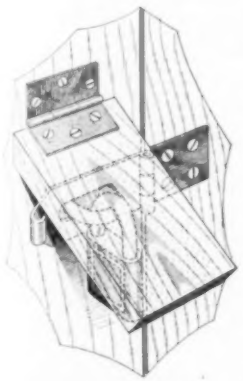
Pieces of Wood between Spokes of Auto Wheels Help to Jack Car Out of a Mud Hole

ahead so far that the piece of wood will jam in the fender. In some cases it may be necessary to set the brakes while the piece of wood straddles a rut and then fill in the hole from which the wheel was just removed. —Jerry C. Jarvis, Palmer, Massachusetts.

Clean Contacts on Ford Starter Switch

On motor cars, the operation of the starter can be greatly improved during cold weather by polishing the contact surfaces in the switch. This is very easily done on the model-A Ford. The starter foot button is unscrewed and the four screws that hold the switch to the motor are removed. The switch can be tipped up enough to permit polishing the contact spring in it without removing the battery cable. However, the cable can easily be removed after the switch is taken off the top of the starter, as there will then be more room to swing the wrench and less trouble in grounding the current.—E. T. Gunderson, Jr., Humboldt, Iowa.

Wooden Flap Keeps Rain from Entering Padlock and Freezing



Padlocks used outdoors often become filled with water and then freeze, causing considerable trouble. To prevent this, hinge a piece of 1 by 6-in. wood to the door directly above the lock, so that the water will run down the flap instead of getting on the lock. This flap is rather heavy and therefore not likely to be blown up by the wind, as would be the case if an ordinary rubber flap were used.

It Takes Just a Few Minutes to Convert an Electric Heater into an Infra-Red-Ray Lamp

Electric Heater Can Be Converted into Infra-Red-Ray Lamp

Those who would like to have an infra-red-ray lamp for therapeutic purposes, but cannot afford one of the more expensive types, can use a cheap electric heater for the purpose by making a few alterations. A suitable heater can be bought for about $2. One having a deep bowl or reflector is preferable as the rays will be more concentrated, which is desirable. Remove the wire guard that incloses the heater element, unscrew the latter and substitute an infra-red-ray element, which can be obtained in either the carborundum form or as a lamp. It is advisable to cut a heavy-duty 110-volt rheostat in the line so that the full voltage is not immediately applied to the element or lamp, the life of which is thereby decreased. A rheostat for this purpose can be purchased at any well-stocked radio store. Infra-red rays penetrate more deeply than ultraviolet rays, and there is no danger of burns owing to overexposure, as is the case with the latter.

¶To make enamel adhere to any bright tin surface, rub the surface first with a rag dampened with some cut muriatic acid, such as used for soldering flux.

"ROAMER" A Outboard

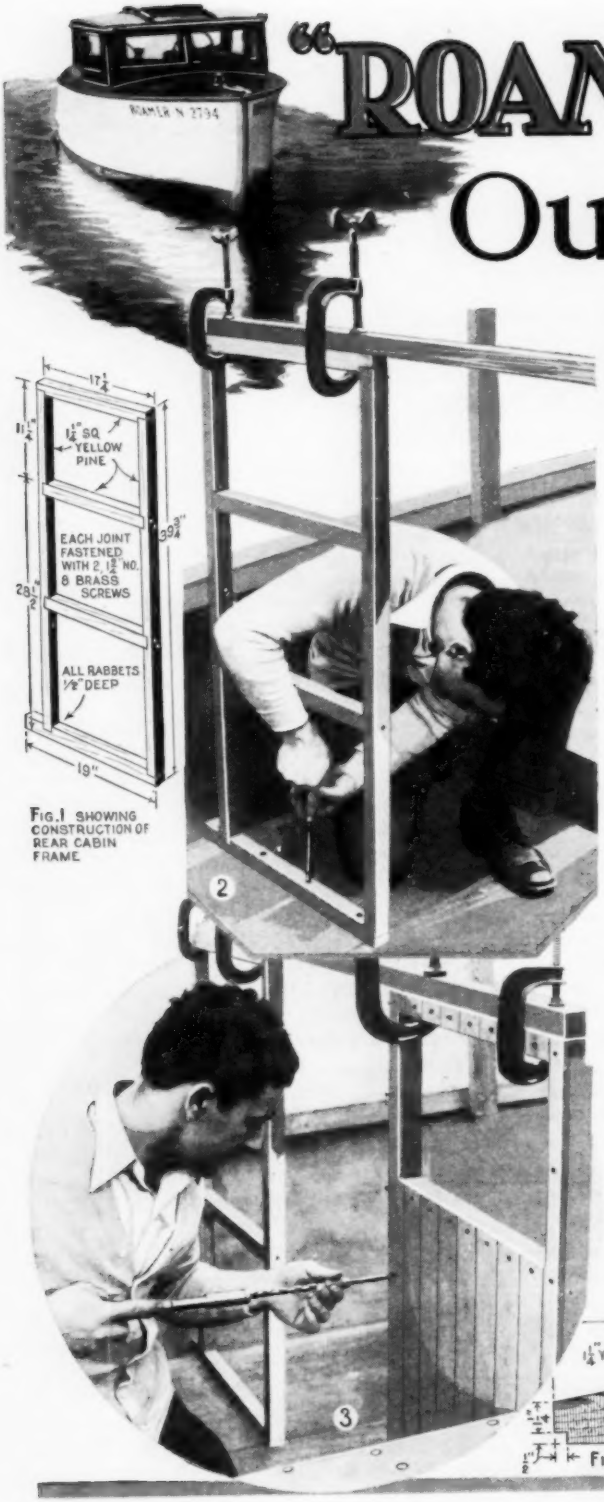


FIG. 1 SHOWING CONSTRUCTION OF REAR CABIN FRAME

OUR cruiser begins to take on the appearance of something really smart with the addition of the cabin sides and beams to be described this month. Partly filling that long open space between the forward deck and the transom board does something to the lines of the half-finished cruiser, something which means all the difference between mere hull and real boat.

Starting out, make two frames similar to the one shown in Fig. 1, one for the starboard (right) side of the boat, the other for the port (left) side. Fig. 2 shows how these sections are fastened into place immediately forward of frame 5, with four 1¾-in. No. 10 screws through the lower support into the floor, and one ¼-in. bolt through the side member into the long beam piece. These frames should be tied across the top with a temporary piece of timber held in place with clamps. Of course, you will use the level and the square in putting up these end sections; also, you must check the lengthwise and crosswise level of the boat before commencing work on any part of the cabin.

The frames may be covered immediately after they are fastened, using 6-in. widths of ⅜-in. mahogany, scored with two sawcuts to resemble narrow strips of plank-

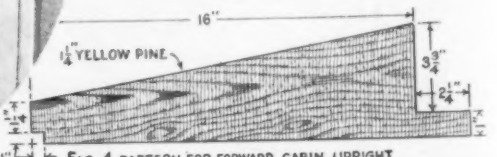
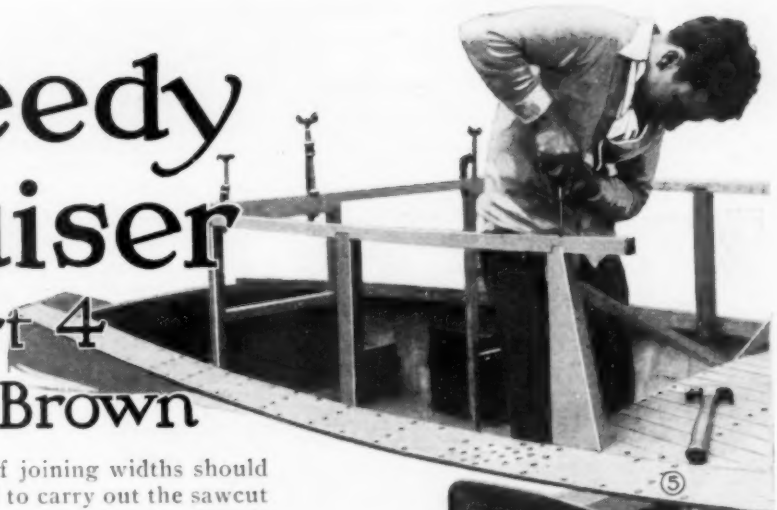


FIG. 4 PATTERN FOR FORWARD CABIN UPRIGHT

Speedy Cruiser

Part 4

by Sam Brown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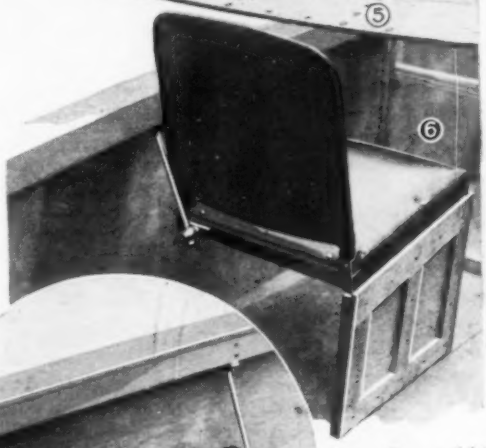
ing. The edges of joining widths should be slightly beveled to carry out the sawcut effect. Fig. 3 shows how the planking is cut off flush all around, extending from the floor up to the window opening and then up to the top edge of the frame. Fastenings should be No. 6 brass screws, 1 in. long. For a really neat job, these should be countersunk and plugged. Driven flush, however, they make a more solid binding between the siding and framework.

Fig. 4 gives the pattern for the 18¼ in. long uprights at the forward end of the cabin. A study of these pieces and the places where they are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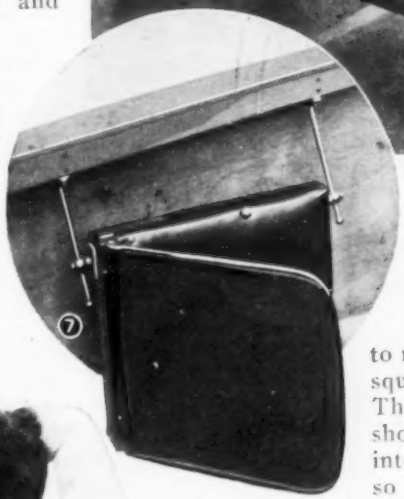
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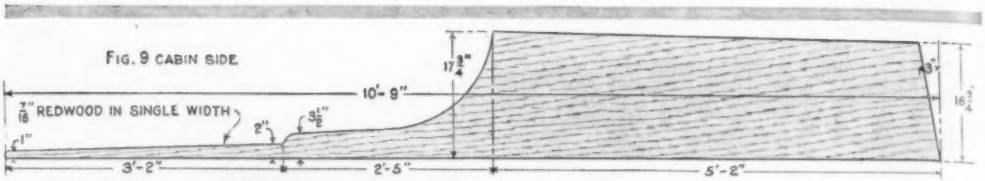
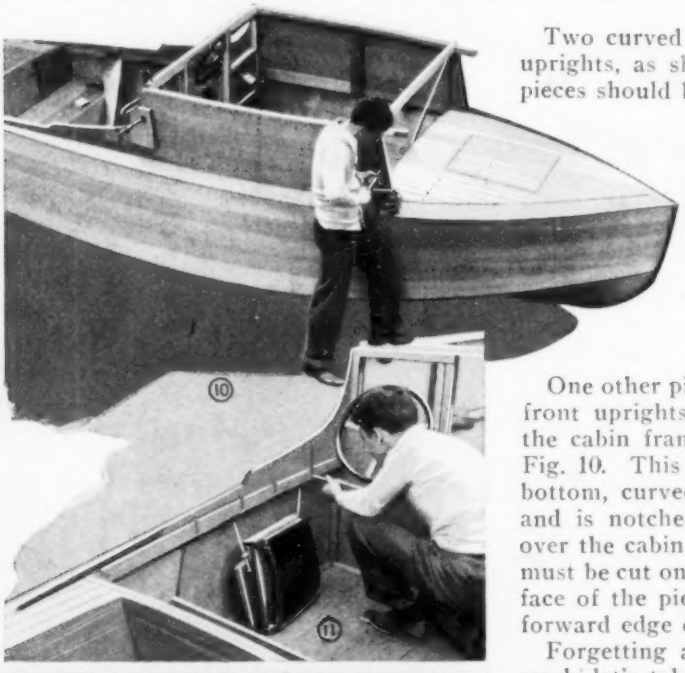
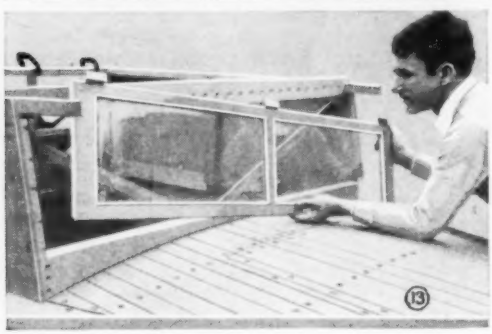
to fit will show you that practically all of the edges must be beveled in order to make possible a square, plumb fit. These uprights should be bolted into place, and also screwed from the underside of the decking. Midway between rear and forward uprights are bolted two pieces of 2½ by 1¼-in. yellow pine, one on each side of the boat. Fig. 5 shows all of the uprights in place. Notice that the forward posts are temporarily braced with light diagonal pieces to hold them plumb.







Two curved pieces are used to top the uprights, as shown in Fig. 5, and these pieces should be half-notched to fit. The proper curve for these pieces is the same as the curve on the deck immediately below it. Notice that the forward end is not cut off flush, but left projecting several inches to furnish timber for the sunvisor to be described later.

One other piece, a beam to span the two front uprights, is necessary to complete the cabin framework, as may be seen in Fig. 10. This piece is straight along the bottom, curved up ¼ in. along the top, and is notched out at each end to slip over the cabin sidepieces. These notches must be cut on a bevel so that the forward face of the piece will be in line with the forward edge of the front uprights.

Forgetting all about the cabin framework, let's take a look at the pilot's seat. This is nothing more nor less than one of the folding seats carried in seven passenger automobiles. Your local junk dealer or auto wrecker can probably supply you. Details of how the seat is converted for marine use are shown in Figs. 6, 7 and 8. Fig. 6 shows the seat open; Fig. 7 shows it half closed. As can be seen in the pictures, two window regulators are used to support the seat from the long deck beam. The wooden support on the inside edge is fastened to the seat with two hinges, as shown in Fig. 8, and this support serves in the same capacity as the original front support which is found on the seat as used in automobiles. Because of the wide variations in these seats, no rules for their conversion can be given. However, it is easy. Get the seat, get the window regulators, and you will soon get the idea of this simple and practical folding seat.

The proper shape for the cabin siding, which also extends back to form the coam-

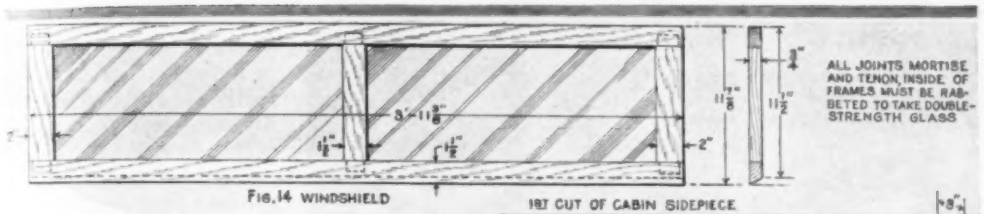


FIG. 14 WINDSHIELD

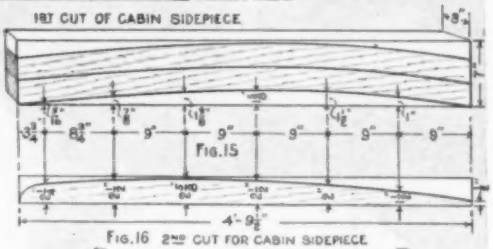


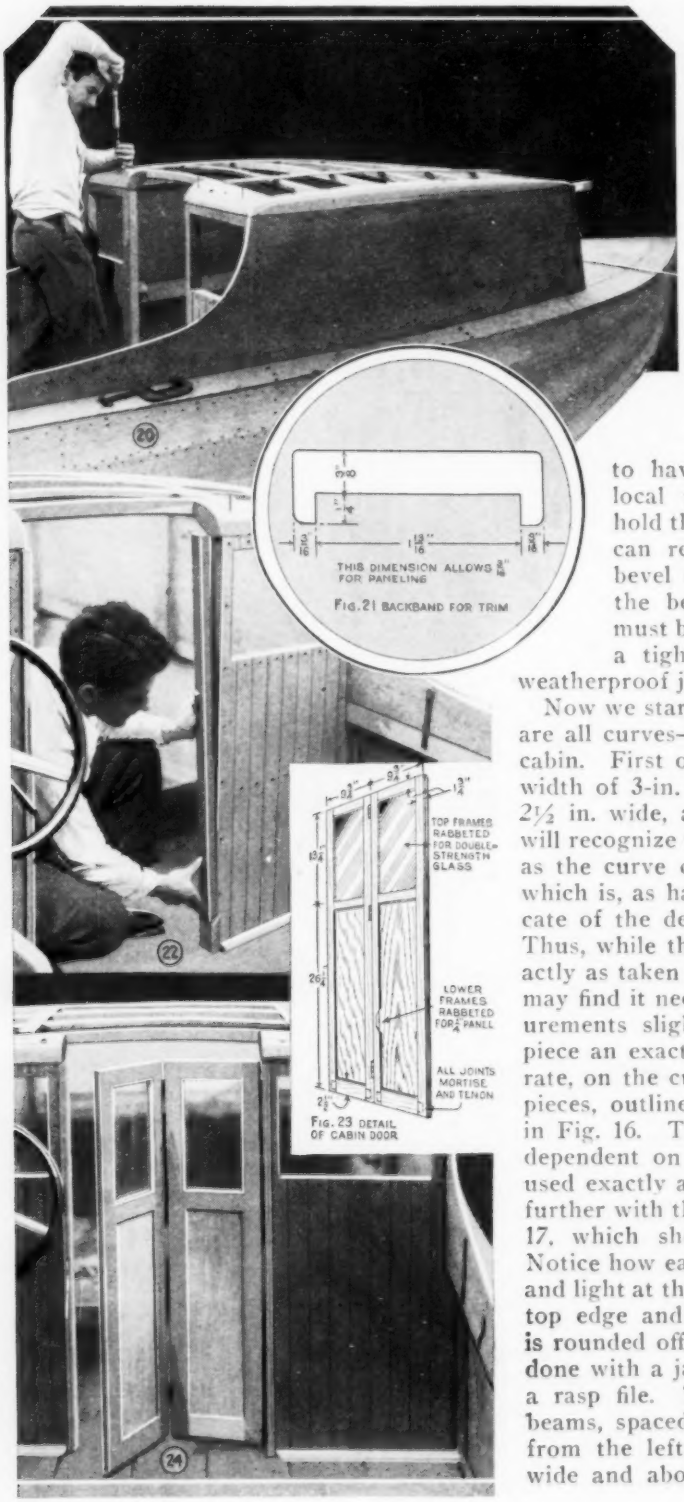
FIG. 15 CUT OF CABIN SIDEPIECE

FIG. 16 2ND CUT FOR CABIN SIDEPIECE

ing, is shown in Fig. 9. If these pieces are cut from redwood, each side can usually be fashioned from a single width of timber; if mahogany or other wood is used, it is necessary to join two strips to get the required width. Each piece is fastened into place with 1¼-in. No. 6 brass screws, as shown in Fig. 10. The lower edge of the cabin side is faced on the inside with 3-in. strips of mahogany, and these are fastened with screws to both cabin side and beam strip. Sufficient timber should be left projecting beyond the forward uprights to overlap the windshield framework, which is to go on later.

The coaming, that is, the extension of the cabin sides to the rear, is held in place with galvanized braces, set into both coaming and deck beam, as shown in Fig. 11. An inner piece of ⅜-in. stuff is used to face this piece on the inside, this inner strip extending ¾ in. below the deck beam. The two sections are held together and to the hull by double-ended bolts, fitting from side to side and inserted through the metal braces between the two pieces, as in Fig. 12. Both ends of each bolt are fitted with a cup washer. Cup washers are used also on screws which fasten the inside coaming strip to the deck beam, but these are not put in until after the varnishing or painting has been completed.

Consider, now, the forward end of the cabin, as shown in Fig. 13. Notice that a piece, cut to fit the deck and beveled on the top side, is fitted on top of the deck from one forward upright to the other. This piece is of ¾-in. mahogany and measures 1 in. across at its narrowest part, widening gradually to follow the arch of the deck. The top of the windshield frame is likewise made of ¾-in. mahogany, and this piece is notched at either end to slip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THIS DIMENSION ALLOWS 5/8" FOR PANELING
FIG. 21 BACKBAND FOR TRIM
22
TOP FRAMES RABBETED FOR DOUBLE-STRENGTH GLASS
LOWER FRAMES RABBETED FOR 1/4 PANEL
ALL JOINTS MORTISE AND TENON
FIG. 23 DETAIL OF CABIN DOOR
24

over the lengthwise cabin beams. Two ½-in. widths of mahogany, fastened directly onto the face of the forward uprights, complete the window framework. All of these pieces are securely screwed, the bottom piece being held by screws inserted from the underside of the deck.

Fig. 14 gives the proper dimensions for the windshield—a two-window affair. Unless you are quite skilled at woodworking, it is advisable to have this turned out at the local mill. Three brass hinges hold the windshield in place. You can readily understand that the bevel on the window frame and the bevel on the window itself must be the same in order to make a tight-fitting and thoroughly weatherproof joint when window is closed.

Now we start work on two pieces which are all curves—the top sidepieces for the cabin. First outline and cut from a 7-in. width of 3-in. thick redwood, two pieces 2½ in. wide, as shown in Fig. 15. You will recognize this curve as being the same as the curve on the topside cabin beam, which is, as has been mentioned, a duplicate of the deck curve directly below it. Thus, while the dimensions given are exactly as taken from the original boat, you may find it necessary to change the measurements slightly in order to make the piece an exact fit on either side. At any rate, on the curved edge of each of these pieces, outline and cut the shape shown in Fig. 16. These measurements are not dependent on any others, and should be used exactly as given. Before going any further with this explanation, look at Fig. 17, which shows the pieces going on. Notice how each side is heavy at the back and light at the front, and how the outside top edge and rear corner of each piece is rounded off. This rounding-off is best done with a jackplane, following up with a rasp file. The notches for the cabin beams, spaced 3¾, 8¾, 9, 9, 9 and 9 in. from the left side of Fig. 16 are ¾ in. wide and about the same depth. These

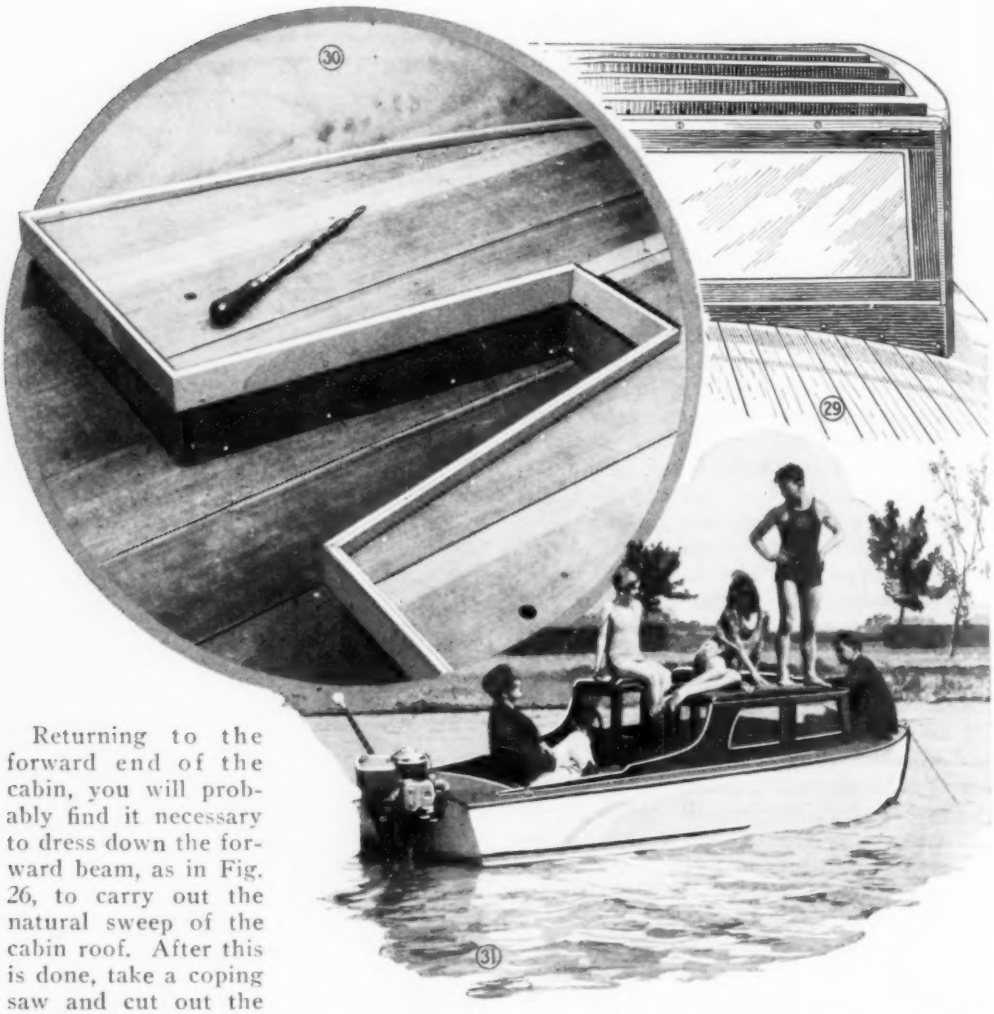
are shown in Fig. 18. Fastening these molded pieces into place is simply a matter of long galvanized screws, countersunk as in Fig. 17.

The cabin beams come next. These are cut from ¾-in. red elm or yellow pine and are 1⅛ in. wide. There are six beams, as can be seen in Fig. 19. The arch of these beams gradually increases from front to back. Beam 1, immediately behind the windshield frame, has a rise of ⅛ in., beam No. 2 a rise of ¼ in., and so on, increasing ⅛ in. for each succeeding beam. Beam 3, being an important timber in later cabin work, is cut from 1¼ in. stock instead of the thinner lumber. All beams should be rounded on the underside, or capped with ¾-in. half-round molding.

The connecting timbers that hook the final beam to the rear of the cabin are pieces of 3-in. square redwood, planed down to large quarter-round blocks, and then fastened into place, as in Fig. 20. The underside of each of these endpieces is cut on a straight bevel from the underside of the rear beam to the top edge of the rear frame.

Pieces of double backband stock, of the size shown in Fig. 21, are used to form a facing for the cabin doorway, as shown in Fig. 22. Fig. 23 gives all the necessary dimensions for the double door used on this craft. It is made from ¾-in. mahogany. Here, again, it is advisable to let the lumber mill handle the work on this job. The door is fastened in place with six brass hinges, three of these to allow the left-hand section to double back on the right section, and the other three to let the door swing to the inside of the cabin, as shown in Fig. 24.

You have probably noticed that the steering wheel is in place in most of these photographs. This is the familiar short type especially designed for use on outboard craft and carried by all leading boat-supply houses. Its installation needs but little explanation, being merely a matter of a hole through the rear cabin siding and four bolts to hold the outfit in place, these being backed with a suitable block of 1¼-in. yellow pine, as shown in Fig. 25. Observe the diagonal braces in this photograph, likewise repeated on the opposite side of the cabin back, to prevent the frames from edging inward.



Returning to the forward end of the cabin, you will probably find it necessary to dress down the forward beam, as in Fig. 26, to carry out the natural sweep of the cabin roof. After this is done, take a coping saw and cut out the sunvisor supports to the shape indicated in Fig. 27; then shim up the top and outside of these "ears" and rasp to shape to carry forward the natural sweeps of the sides and roof of the cabin, as shown in Fig. 28. Notice, in this picture, how the two ears are spanned with a ¾-in. width of strap iron. This is faced with a ¾-in. square strip of wood to form a nailing strip for the top upholstering, as shown in Fig. 29.

Before closing this month, we may as well put on the trim strips around the bunks. These are ⅝ by 3-in. mahogany, rounded on the top side. Fig. 30 shows how they are placed and fastened with 1-in. round-head brass screws. Notice also in this photograph that strips of ¾-in. quarter-round mahogany are used to trim the bunks where they butt up against the panel board. Similar quarter-rounds should also be used all around the flooring, both inside and outside the cabin. If the floor is to be covered with linoleum, these pieces should be but temporarily attached. Later, when the linoleum is laid, they can be permanently fastened.

Next month will bring "Roamer" to a conclusion; so, get busy now with sandpaper in preparing the boat for the various paint and varnish coats. Never can there be too much sandpapering done on this or any other boat, and starting now and doing a little bit now and again makes it a far more cheerful job than one long grind.

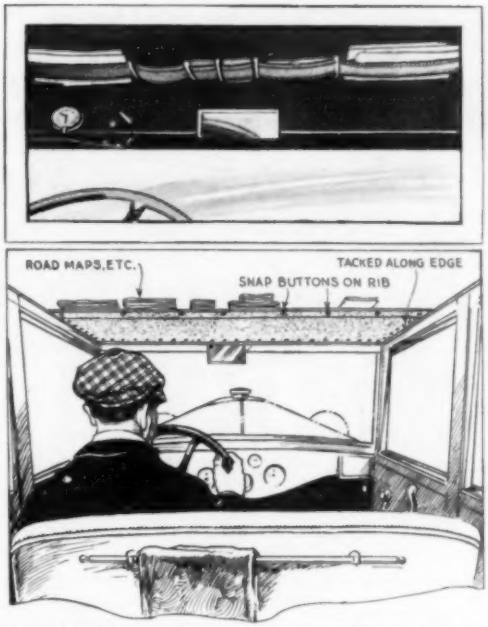
Drying Large Photo Prints Quickly

When drying large photo prints, it is customary to place them between two pieces of heavy cardboard to prevent curling, but this method has the disadvantage of requiring practically all day for the prints to dry thoroughly. A much better way, and one that dries them out in an hour, is as follows: Get a few large sheets of heavy mattboard, obtainable from any lumber dealer. Place the prints between two sheets of such board and lay them on a table on a few blocks of wood to provide free circulation of air. Being porous, the mattboard absorbs the excess water on the prints, thus allowing the air to penetrate, which helps to dry the prints quickly. Large sheets of mattboard can be had for about 30 cents each, and can be used repeatedly without warping.

Moth Balls on Roosts Keep Lice Away

Moth balls have been found highly effective in keeping lice out of a poultry house. The roosts were fitted with blocks, each of which accommodated just one hen and thus prevented crowding. A hole, large enough to receive one moth ball, was then drilled in each block and also in the roost between the blocks, as shown in the drawing. In attaching the blocks woodscrews were used, these being driven in from the underside of the roosts. It seems that lice cannot endure the strong odor of the moth balls.

Moth Balls Held in Holes Drilled in Roosts Keep Lice Away from Hens



Two Methods of Providing a Convenient Place for Keeping Road Maps, Etc., in the Car

Holder Keeps Maps Handy in Car

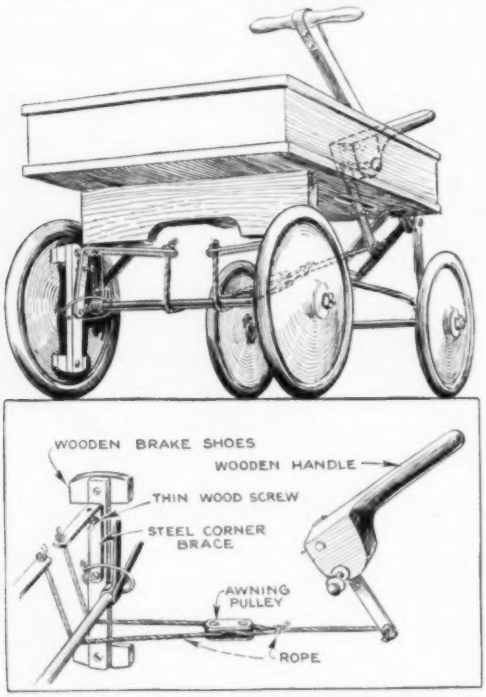
It is usually rather difficult to find a suitable place to carry maps, pipes, cigarets, matches, etc., in your automobile. Simple methods of providing a convenient place for these items that will not interfere in any way with the movements of the driver or other occupants, are shown in the drawing and photo. A strip of wide, elastic fabric is stretched across the top and is fastened as indicated. One method to fasten it is to use tacks and snap buttons, and consequently this is a more permanent installation than the one shown in the photo where safety pins are used to hold it in place. In the latter method the pins are spaced apart so that each intervening space will accommodate an object for which the space is intended.

Drying Colored-Silk Dresses

When drying colored-silk wash dresses, turkish towels are helpful in absorbing moisture and preventing the colors from running, according to government experts. Use three towels, one below, one between the front and back, and one on top. Then roll up firmly and leave the garment this way until it is dry enough to iron.—E. G. Moore, Washington, D. C.

Brake Lever for the Boy's Coaster Saves Shoe Leather

Most coaster wagons have one disadvantage and that is the absence of a brake



Homemade Brake for the Boy's Coaster Wagon Proves a Saving on Shoe Leather

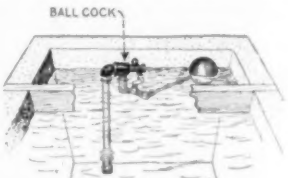
lever, which necessitates or rather encourages the user to drag his feet on the sidewalk. This practice is extremely hard on shoe leather, and the needless wear can be prevented by making a hand brake as shown in the illustration. It consists of a piece of wood with a wooden block at either end to apply pressure to the inside of the wheels, this design being intended for use on disk wheels only. To hold the brakes loosely in position, a cleat is nailed to the underside of the body, just above the axle, and two corner braces are pivoted to the ends of the cleat with screws. The lower end of each brace is similarly pivoted to the brake with a screw, while a second screw is used to hold the brake in a vertical position. A wire loop is also used to hold the assembly in place, the wire being threaded through a small hole in the crosspiece of the brake and slipped around the rear axle. When the end of the horizontal part of the corner brace is pulled down, the brake should be forced against the wheel. An L-shaped lever is then pivoted to the inside of the cart as indicated, the lower end projecting through the floor. A piece of stout rope connects this end of the lever to an awning pulley, while another length of rope is slipped through the pulley. The ends of the latter are brought under the rear axle and tied to the ends of the corner braces. Obviously the action of pulling the lever causes a pull on the braces which forces the brakes against the wheels. The pulley is used to equalize the pull to both wheels.

Cleaning a Steel Tape

If your steel tape is rusty and the figures hard to read, mix about ½ oz. of emery dust with 2 oz. of vaseline. Rub this briskly on the tape with a piece of flannel until the tape is clean. After wiping off the paste, rub the tape with mercury ointment, which can be purchased at any drug store. Frequent use of this ointment will always keep the tape bright. —R. C. DeMay, Akron, Ohio.

Automatic Faucet for Watering Trough

Stock-watering troughs can be kept filled with water automatically by installing a ball cock and float as shown in the drawing. As soon as the level of the water drops to a certain point, the cock opens and supplies water until the float again closes it. It is advisable to build a strong frame inclosure over the end of the tank where the water is supplied, in order to prevent any injury to the apparatus.—R. D. Rose, Clayton, Miss.



Shaving the Electric Bill

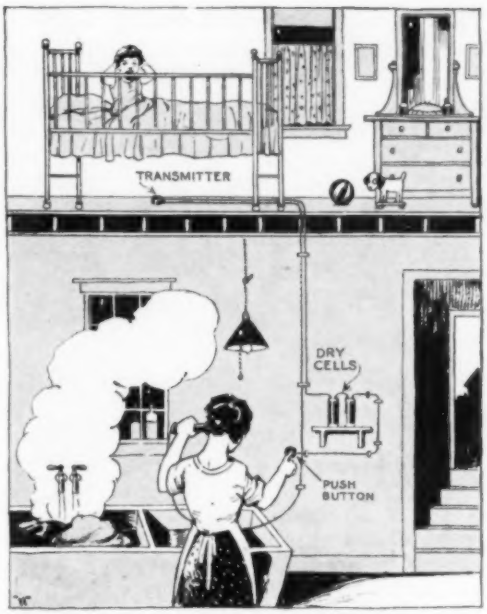
When defrosting your electric refrigerator it is needless to turn off the current overnight and allow the entire box to become warm. Simply turn off the electric current, take out all the ice trays and with a long-handled dish mop swab out

the compartments, using cold or lukewarm water, but not hot water. Repeat the operation three or four times, using fresh water each time and allowing a few minutes between each swabbing. You will find the ice around the front of the compartment has softened and is loose enough to permit it to be removed with the fingers. Never use a pick or any other tool for this purpose. Then swab the bottom of the ice compartment in the same manner. The layer of ice will loosen and may be removed with the fingers in large sections. The layer of ice on the sides will be softened by this time and by carefully inserting the fingers at the bottom of the compartment, you can loosen the side layers of ice and remove them in large pieces. The ice on the mechanism at the top of the compartment may be removed in the same way, being careful not to interfere with any of the tubing, etc. After washing the trays, the current can again be turned on. After you have once defrosted your refrigerator in this manner, you will find it a simple task, the whole operation consuming less than 45 minutes. Do not try to remove any of the ice, however, until it is sufficiently softened to be picked off without the least violence.

Motor Heat Keeps Windshield Clear

It is a comparatively easy matter to prevent sleet and rain from freezing on the windshield by directing some of the warm air around the motor against the glass. This can be done by merely loosening the rear clip on one side of the hood and inserting a small block of wood, such as a piece of 2 by 4-in. stock, under the rear edge as shown in the illustration. The warm air coming out of the opening strikes the windshield and prevents ice formation.—Dick Hutchinson, Ithaca, N. Y.

Warm Air Directed against the Windshield Prevents Rain and Sleet from Freezing

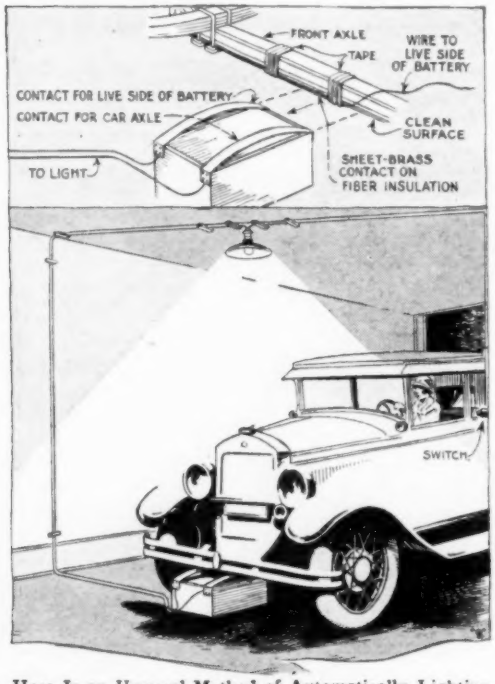


Mother Need Not Run Upstairs to Find Out When Baby Wakes; She Just Listens on the Telephone

Improvised Telephone for Listening to the Baby

Running up and down stairs a number of times on washdays in order to find out whether or not the baby was awake, was eliminated by improvising a telephone system from the baby's room to the laundry. A small microphone was placed underneath the cot, and the two wires were run into the laundry, where connections were made to dry cells, a push button and a receiver. When the push button is pressed the circuit is closed, the dry cells furnishing enough energy to permit the transmitter to pick up the sounds in the child's room and convey them to the receiver. Such an installation costs only a few dollars and will save countless steps.—Mrs. Norma M. Jones, Oak Park, Ill.

Car Battery Furnishes Garage Light

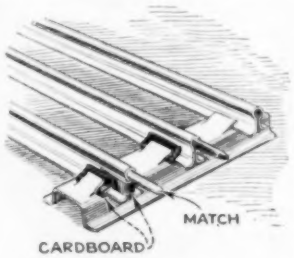


Here Is an Unusual Method of Automatically Lighting the Garage

In the absence of electric lighting in your garage, a satisfactory light, sufficient for closing the doors, etc., can be provided by the car battery. Without using an extension cord to a lamp socket on the car, the illustrated method makes the connection automatically when the car is driven into the garage, even eliminating the need of getting out to turn on a switch. A weighted box is provided with two strips of spring brass, tacked to the side and extending over the top as shown in the detail. When the box is set on the floor, the height of the strips must be such that the axle of the car will make contact with both. A wire is connected to each contact strip and is run to a lamp socket attached to the ceiling, or in any other suitable position. It is advisable to provide a switch also in one of the lines, although this is not shown in the drawing. At the point where the underside of the axle makes contact with one of the strips, a piece of sheet fiber or other insulation is applied, and over this a strip of brass or copper, both being securely bound to the axle with tape. A length of wire is then connected to the underground side of the battery and to the brass strip under the axle, the wire being soldered to the strip. Now, as the axle itself is part of the grounded side of the lighting system and the brass strip is connected to the ungrounded side, electric current from the storage battery is available when a connection is made between these two points, as is done when the car is driven onto the spring strips on the box. Of course, the car must be driven into exactly the same position each time to assure proper contacts, and care must be taken, in making this installation, that the bumper, radiator shell or any other piece of metal except the axle does not touch both contacts on the box, or a short circuit will result. Instead of extinguishing the light by pushing the car back off the contacts, merely throw the switch open, but be sure to close it again when taking the car out of the garage so that the circuit will be made automatically when returning.—George F. Read, Everett, Mass.

Automatic Signal for Toy Electric Train

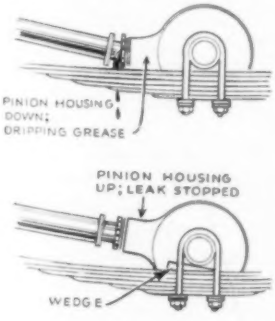
An automatic crossing signal for a toy electric train, using an old doorbell, is easy to make. The two outside tracks form one conductor for the current while the middle track forms the other. Both outer tracks are connected electrically and mechanically by means of pressed-tin ties, but the middle rail is insulated from the two outer ones. By prying back the punched sections of the ties that clamp one of the side rails, small strips of heavy tough paper or light cardboard can be inserted, as indicated, to insulate this rail from the other outside one. A piece of cardboard is also provided around the end of the insulated side rail to prevent it from making contact with adjacent track sections. The tie is then pressed back in place, holding the cardboard securely in place around the rail. Further insulation may be obtained by removing the steel pins used to connect this rail with the next sections and substitut-



ing matchsticks. By the use of a clamp provided with the train, connections can be taken from the middle rail and the insulated side rail to the bell. The insulation on the rail prevents a complete circuit and the bell is silent. But as the train passes over this section, connection is made from the insulated rail to the wheels, through the cars to the set of wheels on the other side, and to the opposite rail, completing the circuit with the result that the bell rings. As the train leaves the insulated section of track, the bell is again silent. A resistance may be used in series with the bell to cut down the current.—B. Moeddel, Jr., St. Bernard, Ohio.

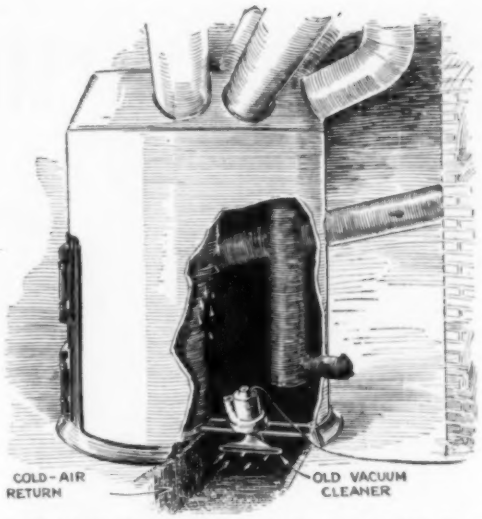
Curing Rear-Axle Grease Leak

Here is an effective cure for grease leaking out of the front end of a rear-axle-pinion housing. This part usually is fitted with a felt grease retainer or metal washer to keep the lubricant in the housing. But as the springs sag, the front end of the pinion housing which carries the weight of the driveshaft, frequently sags also, making it impossible to hold grease. Re-arching the springs, or installing new ones, is a cure, but a better one is as follows: Get a pair of wedges for tipping the front axle to cure wheel shimmy. Loosen the U-bolts that hold the rear axle to the springs and drive in the wedges so that the front end of the pinion housing is raised.



Artificial Draft Increases Efficiency of Furnace

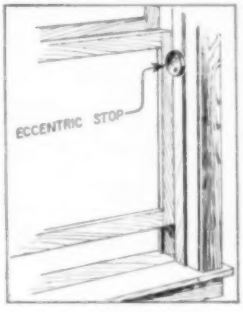
A common fault with hot-air furnaces is their inability to deliver heat to the windward side of the house. My furnace was no exception, and besides was too small to heat the house properly. To remedy these conditions I purchased an old vacuum cleaner for $1.50, sawed off the handle and connected the long cord to the basement lighting circuit, which was controlled by a switch in the kitchen. Then I hung the blower in the enlarged cold-air return pit so that the intake was well off the bottom to avoid picking up dust. The outlet was directed upward so that it blows directly against the hottest spot in the firebox, forcing the warmest air away through the pipes to the rooms above. When the wind is from the north, the registers in the south rooms are closed so that all the hot air must pass up to the north rooms whence it flows through the house. It has been found that this arrangement warms up the house in a short time and maintains an even temperature.—Chester S. Emmert, Denver, Colo.



Artificial Draft Forced through Furnace by Old Vacuum Cleaner Heats House Quickly

Eccentric Stop for Windows

On windows that have no sash weights to keep them open, the stop shown in the illustration will take their place. It is just a hardwood disk with a hole drilled through it off center, to receive a screw with which it is fastened to the window frame. Turning the disk one way or the other frees it from contact with the sash or jams it.—Charles H. Willey, West Concord, N. H.



Telephone Cabinet

by R.O. Buck

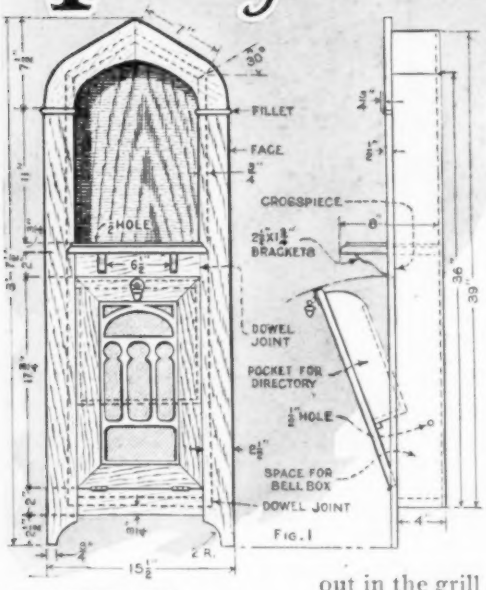


FIG. 1

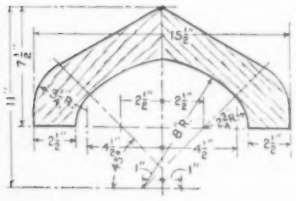
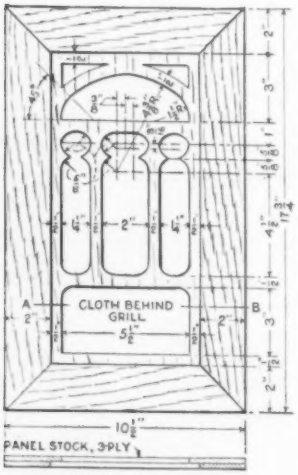


FIG. 2



SECTION THROUGH A-B
FIG. 3

MOST built-in telephone cabinets are rather boxlike affairs that are suitable for use only in the kitchen, but the cabinet illustrated and described in this article can be placed in any room in the house, is easily installed and is both handsome and practical. The telephone rests in an arched alcove, on a shelf, which extends from the wall sufficiently to enable you to write on it if need be. The lower compartment is made to contain the directory and bell box, and is sufficiently large to take the directories used in Chicago and New York. The cloth-backed grill makes the sound of the bell audible practically as well as if it were outside. The Gothic-arch motif, which has been carried out in the grill as well as above, gives a very pleasing effect.

Wood of the same kind as is used for the trim in the room in which the telephone is located, should be used for the cabinet, so that the finish may be made to match. If an enameled finish has been used on the trim, any close-grained hard or soft wood may be used. It is not advisable to use yellow pine, however, as the grain is likely to show through the enamel, regardless of the number of coats applied. The fabric behind the grill may be gold cloth, tapestry or any of the materials commonly used in the grills of radio cabinets.

The first step in the construction is the cutting of all the stock to approximate or rough size, so that the job may go forward in an orderly manner. After this has been completed, the sides, top and bottom pieces of the ¾ by 4-in. frame should be planed to size and the inner faces smoothed and sanded. A ¼-in. rabbet should be cut on the back edges of all of the frame pieces with the exception of the crosspiece. If the sides and tops of the frame are cut a little longer than necessary, it will be much easier to saw the 30° bevels on the ends to form the joints, and it may be necessary to dress the bevels with a plane to insure a reasonably tight joint. The bottom and sides of the frame should be assembled first, then the crossrail that goes under the shelf may be used as a spacer while the top pieces are being fitted and assembled. Strips of scrap lumber, tacked diagonally across the edges of the frame, will keep it rigid and square during the process of assembly. Both glue and nails are advisable in fastening

is Built in Wall

the top pieces to the sides, the nails being driven parallel with the sides of the frame. Holes for the nails should be drilled if hardwood is used. After the top pieces are fastened, the crosspiece which has been used for a spacer may be nailed into place, as indicated on Fig. 1.

The ¼-in. three-ply backing should now be fitted, carefully smoothed and sanded on the front face, and nailed into place with ¾-in. brads. This will make the frame sufficiently rigid so that the strips across the front may be removed.

The shelf has a formed edge which adds greatly to the attractiveness of the cabinet. After the stock has been cut to the shape shown in Fig. 4, a deep cut should be made around the edge with a marking gauge set to ½ in. A ⅛-in. cut should also be made on the thickness, measuring from the top down. With a backsaw and chisel, cut away this ⅛ by ⅝-in. portion entirely around the curved portion. Finish up the molding with a plane, file and sandpaper as shown. After the shelf has been well sandpapered, bore a ½-in. hole near one of the back corners for the phone cord, then fit to frame and nail into place. Note that a 1 by ½-in. notch is left to insert the face pieces on each side of the shelf. Fig. 8 shows how this part of the job will look.

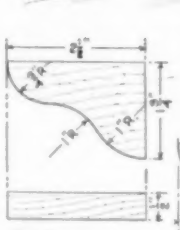


FIG. 5 BRACKET, 2 REQ.

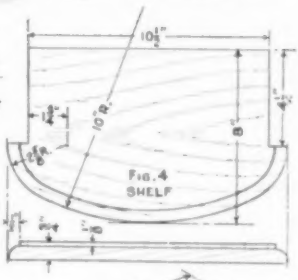


FIG. 4 SHELF

The face consists of the pieces which cover the joint between the frame and the plastered wall, also the center and bottom crossrails shown on the figures. The face should be framed up as a unit and jointed, but should not be nailed to the frame until the frame has been installed in the wall; it should, however, be tacked into place temporarily so that it may be well fitted.

The sidepieces should be planed to size first and the arched end cut with a coping saw, as shown on Fig. 2. One face and both edges of these pieces should be smoothed and sanded. The crossrails should next be made and joined to the rails with ¼-in. dowels at each joint,

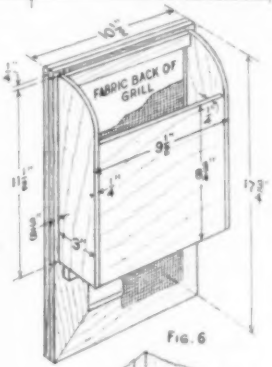


FIG. 6

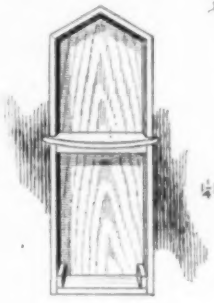


FIG. 8

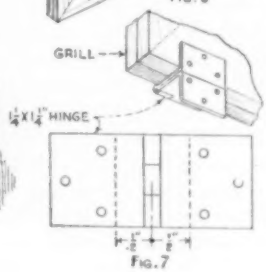
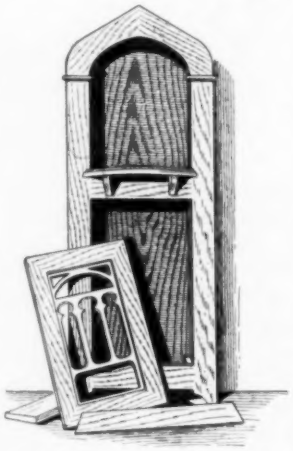


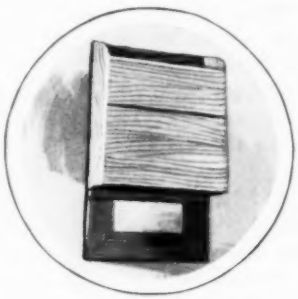
FIG. 7

properly glued. Be sure to square and gauge the centers for the dowel holes so that they will line up and make a true joint. The face should now be tacked into place as suggested above. The fillet blocks (Fig. 1) form the joint between the arch and the sidepieces, without glue, so as to take up irregularities caused by shrinkage and swelling. After the assembly has shown that the joint at the top of the arch is true and tight, a spline joint should be made at this place as follows: Gauge from the face of both pieces a distance of ¼ in. in along the jointed edge. Along this line, make a saw cut ½ in. deep with the saw in your kit that makes the widest kerf or cut. In this kerf insert and glue a thin piece of wood to keep the two pieces of the arch even and level. The grain of the spline should run across the joint. Retack the arch to the frame.



The door for the directory and bell-box cabinet is made in the form of a grill. The design shown in Fig. 3 should be worked out full size and traced onto a piece of panel, preferably of plywood. The panel should be cut and fitted to the opening in the face surrounding the cabinet. With a coping or scrollsaw, cut away the portions indicated in the pattern and smooth the edges of the cut-outs with a file and sandpaper. To add rigidity as well as good appearance to the grill, a mitered frame is fastened to the front face of the grill panel with glue and brads, all nailing being done from the back. The drawing above on this page shows the cabinet at this stage in the construction.

The pocket for the telephone directory may be made of any ¼-in. soft wood. The construction and dimensions of this part are shown in Fig. 6. The pocket is fastened to the back of the grill door with screws, so that it may be removed to install or replace the grill fabric. See lower photo on this page.



The hinging of the door may be done in either of two ways; an ornamental surface hinge may be used or a desk hinge may be bent as shown in Fig. 7. The former is much the simpler and easier method, but the latter has the advantage of housing and practically concealing the hinges.

The cabinet is now ready for cleaning up, sanding with No. 0 or 00 sandpaper, and finishing. As suggested at the beginning, the cabinet should be made to match the woodwork or trim of the room, both as to material and finish. The finishing cannot be completed in the shop, however, as it will be necessary to do some nailing when the case is installed, which means holes to fill and cover. If the finish is enamel, your matching problem is greatly simplified. Your decorator can give you the information needed for matching or closely matching stained woodwork.

After locating the place on the wall where you are planning to make the installation, check carefully to be sure that there are no pipes, flues or other obstructions in the walls. Tap on the wall with a hammer to locate the position of the studs. If possible, locate the cabinet between two studs. If this is not possible on account of poor spacing, at least arrange so that only one stud will be cut, if near a door or window where the stud spacing is unequal. Mark out on the wall an outline of the frame, with the shelf placed 32 in. above the floor. Care must be taken to make the lines plumb. Cutting out the plaster is not difficult with a keyhole saw to start the cut, followed by an old crosscut saw. After the hole is made through the lath and plaster, the cabinet should be fitted into place between the studs by wedging. (Be sure telephone connections are brought through the box before the cabinet is nailed into place.) If the cabinet is not between

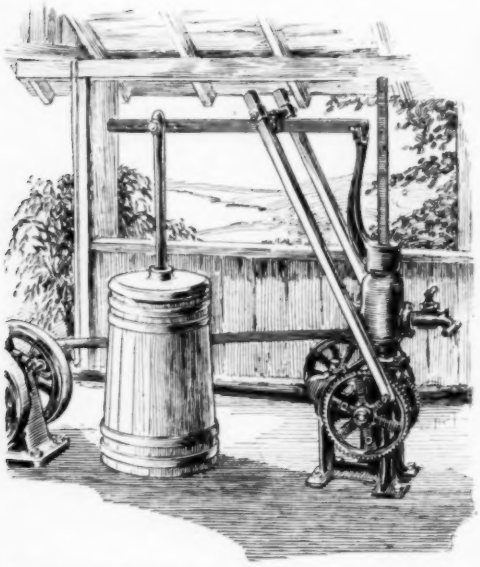
studs, pieces of studding will have to be set in on each side of the opening for nailing. This will be more easily accomplished, if the plaster that sticks through between the lath on the inside is cut away flush with the lath, along the edges where the studs are to be placed.

The installation of the telephone in the cabinet can be done by one of the telephone company's service men or may be done with ease by the home craftsman, provided the rules of the telephone company will permit. The bell box is opened with a screwdriver inserted in what appears like a lock, but is really a machine screw. Inside you will find a series of binding posts to which the various leads are attached. Make a diagram of the position of these posts and the colored wire that is run to each, then disconnect all leads, separate the phone cord and house leads from the box and string the wires through the holes in the cabinet. The three-wire line which comes up from the basement should be pulled through the hole in the side of the cabinet, shown in Fig. 1. The location of this hole is not specified, as it is to be drilled where convenient. After this line wire has been pulled through the frame, the cabinet may be permanently nailed into place. The cord from the telephone should be carried through the hole in the back corner of the shelf to the bell box. Reconnect these leads to their respective binding posts and the installation is complete. This cabinet is intended for use with so-called unlimited and measured service. If coin-box service is used, the coin box must be left outside. In this case, it is suggested that the cabinet be shortened so as to provide cabinet space for the directory only, leaving the bell and coin box on the wall as usual. This will eliminate the large opening at the bottom of the grill, or if preferred, the entire door may be made a solid panel.

Unusual Finish on Lacquered Table

A table that attracted much attention was lacquered apple-green with a base color of dull old-rose on the top. The whole top had a delicate lacy pattern outlined in dim gold, which gave an artistic as well as very unusual effect. This was obtained by using rose-point machine-made lace, stretched tightly over a frame, as a stencil. After the base color has dried thoroughly, the frame is laid upon it, and it is sprayed with platinum bronze mixed with clear lacquer. A coat of clear lacquer is applied last. The lace can be used many times as it dries smoothly in the frame. The resulting pattern is much finer and more delicate than can be made with a cut stencil.

¶There is no necessity for destroying a sealed, stamped envelope if you wish to re-examine the contents before mailing; simply steam the flap open and use a little library paste to seal it again.



Hand-Operated Churn, Actuated by Means of a Pump Jack, Saves Time and Labor

Pump Jack Operates Churn

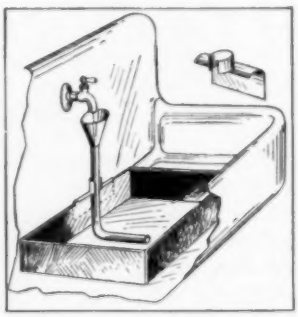
Farmers who use the type of hand churn shown in the illustration, can lighten their labor by connecting it to the pump jack. A connecting rod or walking beam, made of a piece of suitable hardwood, is pivoted to the rigid part of the pump to which the handle is fastened when the latter is used, and also to the top of the churn plunger rod. The pump jack is also pivoted to the walking beam at the point indicated.

Extra Switches on Ford Wired to Seat-Base Panel

Many owners of the model-A Fords find the lack of an instrument board for mounting extra switches a drawback. Its lack, however, is a blessing in disguise, as the panel between the front seat and the floor makes an excellent substitute. When placed there, the switches are as convenient to operate as they be on the instrument board, and are much easier to wire. The lead for the battery supply can be run down through one of the holes in the metal floor of the tool tray under the seat. From there it may go direct to the battery, or, preferably, run forward parallel to the tail-light wire, and be connected to the cut-out on the generator, as the ammeter will then show the drain when the extra lights are used. The push-pull type of switch is satisfactory for the purpose, but a toggle switch is easier to operate if you wear gloves. In mounting toggle switches, the proper "off" position is with the lever down. A 2-way toggle switch, now obtainable, makes it possible to use one switch for two lamps, but they must be lamps that will not be used at the same time. Such a toggle switch is handy for a parking light on one side, and a back-up light on the other. For roadsters and coupes without rumble seats, a light in the luggage compartment is a convenience. A phone jack may be installed alongside the switch, and phone plugs attached to the end of a trouble-lamp cord, or an extension camping light. The earlier A-models do not have parking lights. In most localities only a tail light is required while parking at night. If the lead to the tail light is tapped and a separate lead with a switch is run to the battery, the tail light may be turned on independently of the headlights, and will still be operated automatically by the switch controlling the headlights. Switches may also be mounted on the fiber panel just in front of the door on the left side of the car, which will be handy for the driver to reach, but they must then be mounted so that it will not be difficult to wire them. In this case a ground-return lead is necessary.—J. W. Grosdidier, San Diego, Calif.

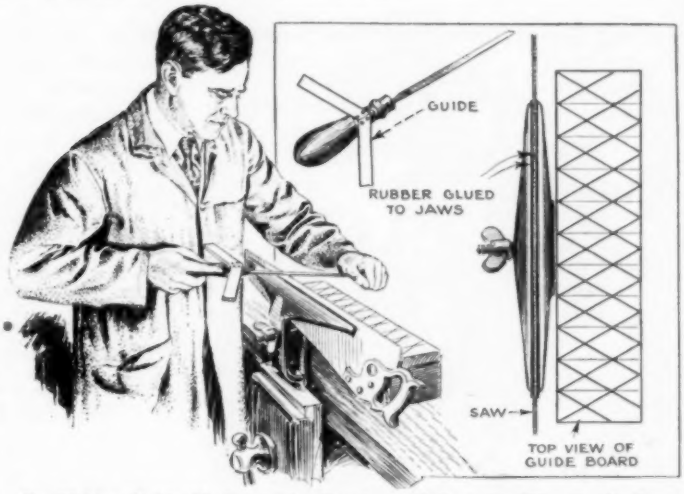
Easily Made Print Washer

Any pan or tray can be used for a print washer and the water can be kept running into it through a piece of tubing of suitable length, as shown in the drawing. On the edge of the tray a removable bracket is attached to hold the tube, which extends up to the faucet and down to the bottom of the tray. A funnel slipped into the upper end of the tube makes it easy to catch the water without splashing.



Preventing Wood from Warping

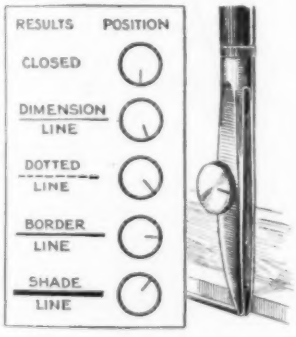
Wood stored for any length of time should be protected against the weather so that it will not warp. As the cut ends are more porous and will absorb moisture quickly, a coating of shellac should be applied. It is best to keep wood in a warm, dry place and care should be taken to have it exposed evenly. Experiments have shown that the top piece on a pile of lumber will warp overnight during a rainstorm. Warping is caused by the unequal expansion of the wood when it absorbs moisture. Long pieces should be set on end to assure an equal exposure.—Wm. P. Mack, Chicago.



By Making Guide Marks on the Bench as Well as the File, the Beginner Will Be Able to File Saws as Well as Experts

Fine Adjustment for Ruling Pen

When working on drawings in which several thicknesses of ruled lines are used, it is necessary to match the width on a piece of scrap paper when a change is made. A much better method is to make a file mark on the adjusting screw of the pen, remembering the position of the mark for lines of different widths. This kink will be found to give accurate results and will save considerable time.—Frank E. Gray, Sparks, Nevada.

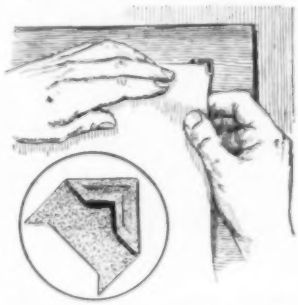


Saw-Filing Helps

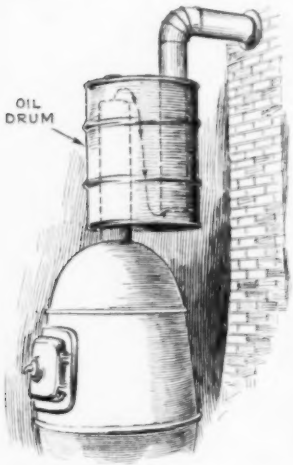
While filing saws, the vibration is not only hard on the ears, but it dulls the file as well. This can readily be prevented by gluing a strip of rubber on each jaw of the saw vise. Another help to the beginner, which may also be used to advantage by old hands, is a guide board for holding the file at the same angle with each stroke. This board is placed behind the vise and the angles marked about 60° both ways. Marks are also made straight across for use with ripsaws. Small pieces may be nailed onto the handle of the file, to enable the operator to hold the file at the same angle as it is easier to watch these pieces than the file.—Lloyd Moore, Chariton, Iowa.

Art-Mounting Corners Used to Hold Drawing Paper

Instead of using thumbtacks for fastening drawing paper to the board, art-mounting corners will be found handy if the sheets of drawing paper used are all of the same size. Glue four of these corners to the drawing board, and it will then be a quick and easy matter to remove and replace the paper. It has been found possible to use one set of corners for fifty sheets of paper. They lie flat and do not interfere with the use of the T-square or triangles any more than the usual thumbtacks.—Walter W. Mallett, Olympia, Wash.



Getting Extra Heat from the Stovepipe



Usually the heat passing through the stovepipe and chimney is practically wasted, but with the arrangement shown in the drawing much of it is radiated into the room. Take an oil drum and put two lengths of stovepipe inside as shown; then mount the drum over the stove, and brace it to obtain the necessary rigidity. The path of the smoke and hot air through the drum and up the chimney is indicated by arrows.

Unusual Decoration for Glass Trays

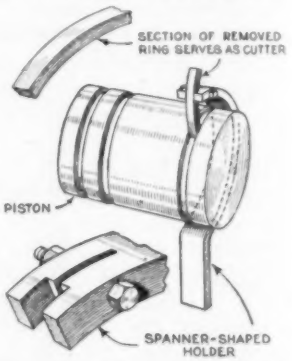
For decorating glass trays, an unusual effect can be obtained by using a number of photos of faces or parts of faces, including the eyes. Colored prints from magazines are particularly effective for this purpose. After cutting them out in various shapes, arrange them according to the method indicated in the photo, pasting them on a piece of cardboard. Gold bronze, or any kind of paint, particularly black or white, is used to separate the photos. The cardboard is cut to the same size as the bottom of the tray, and it is then easy to insert it.

Extinguishing Fire in Auto Carburetor

Flames of a burning carburetor, ignited by backfiring or from any other cause, may be extinguished with safety in the following manner: Let the engine continue to run. Get out, lift up the hood and turn off the gas supply to the carburetor. Then run the motor faster so that the gas remaining in the carburetor will be used up by the motor as quickly as possible, instead of letting it burn up. Do not attempt to smother the flame by means of a blanket, for the moment you confine the gas vapor you provide the right condition for an explosion. —Mart Banke, Detroit, Mich.

Tool for Scraping Carbon from Piston Grooves

When installing new piston rings, it is necessary to remove all traces of carbon in the piston grooves. To do this, the tool illustrated will be found quick and handy. It consists of a holder made somewhat like a spanner wrench, one end of which is slotted and provided with a screw to hold a short piece of broken ring that fits the groove exactly. The end of the piece of ring used for scraping is ground off at right angles, to make contact with the entire surface to be scraped.—George A. Luers, Washington, D. C.



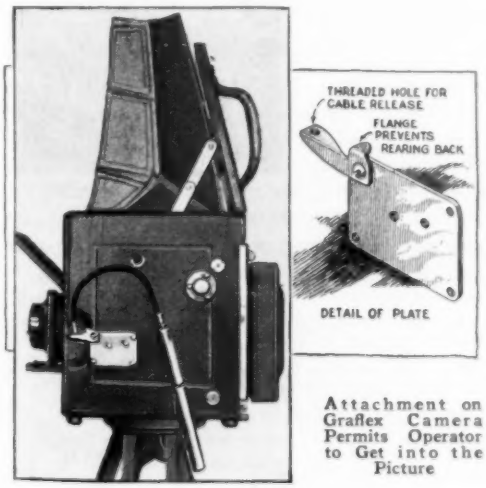
Painting Cement and Concrete

All non-drying oils are more or less destructive to cement, and saturation with raw linseed oil would slowly disintegrate it, but oil paints will dry on the surface without affecting the cement if applied in the following manner: The cement work should be at least one summer old before it is painted. The first thing to do is to wash the surface thoroughly with a 7 or 8-per-cent solution of muriatic acid, followed by a good wash of clean water. The surface must then be given time to dry perfectly. In painting, use considerable more turpentine

than is ordinarily the case, and very little drier. Boiled linseed oil is preferable to raw. For the priming coat, the paint should be used thin. It should also contain so much turpentine that it is almost flat, increasing the quantity of oil for each succeeding coat. Each coat should have about 48 hours to dry before applying the next. If water color or calcimine is preferred, the cement should also be washed and prepared as above. When the surface is dry, it should be given a sizing of equal parts of acetic acid and alum.—Charles R. Whitehouse, Boston, Mass.

Take Your Own Picture with a Graflex

Ordinarily the only objection to a graflex camera is that it is almost impossible for the operator to get in the picture himself. This objection can readily be overcome by providing the attachment shown in the drawing, which consists of a small lever, pivoted at the upper corner of the plate as indicated, the lever being bent over, drilled and tapped to take the cable release. The lever swings freely on its pivot, which is a screw in the trigger plate, and when it is desired to use the camera in the regular way, the lever is depressed, which pushes down the camera trigger, so that, when snapshooting, it is only necessary to remove the cable release. Any attachment that will operate a push cord may be used when the operator desires to get into the picture.—Robert L. Rankins, Springfield, Ohio.



Attachment on Graflex Camera Permits Operator to Get into the Picture

Angle-Iron Bracket on End of Ironing Board Hooks on Screws in the Wall

Wall Bracket Holds Ironing Board

To hold an ironing board rigidly against a wall, get a piece of angle iron, a couple of inches longer than the width of the board. Drill holes through one side of the angle iron so that it can be attached to the end of the board with screws. Drill two holes in the other side, near the ends, and file slots from the latter as shown. These holes must be large enough to be slipped over the heads of two screws driven into the wall, while the slots will just fit over the shanks of the screws. The method of using a board equipped with such a bracket is plainly shown, the bracket being merely engaged with the screws in the wall. Only one supporting leg is necessary at the other end and this can be made to fold against the bottom of the board when not in use.

Precaution against Wastebasket Fire

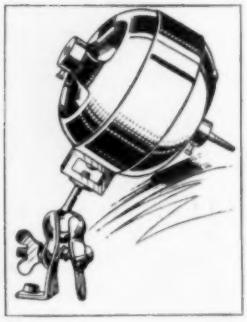
One precaution against fire, which is often overlooked, is to take care not to set a waste-paper basket on the side of the desk where you keep the ash tray. A lighted cigaret stub may accidentally fall into the basket by being knocked off the edge of the ash stand.

Photo of Lightning Flash Taken from a Point 125 Feet from the Water Tower in the Center with Ordinary Camera

Lightning Photos Are Easy to Make

Photography of lightning by the amateur is a comparatively easy matter. A cheap box camera will produce just as good results in this kind of photography as expensive cameras. All that is necessary is to focus the camera for distant objects, point it in the direction of the most frequent flashes, open the shutter and leave the camera undisturbed for the duration of the storm, this, of course, being possible only with night storms. The photo shows the result of a half-hour exposure, and is a record of a violent electrical storm in southern Idaho. The water tank that is silhouetted against the horizon is 120 ft. high and is located a quarter of a mile from the point where the camera was placed. Some idea of the magnitude of the flashes can be gained from the fact that one of them shattered a tree about a mile away.

Mounting for Small Motor



For mounting a small electric motor, a universal holder, frequently used for cameras, will be found highly convenient, as the motor can be set in almost any position desired. Of course, a sheet-metal bracket must be made to fit the motor, and the bracket must be drilled and tapped to take the screw of the holder.—H. Pack, San Francisco, Calif.

Tinning Iron and Steel

Iron and steel articles can easily be tinned by using the following method: First remove the scale from the piece by dipping it in a solution of raw muriatic acid, leaving it there until the piece turns white. Then dip it into a solution of raw muriatic acid, cut with zinc shavings until the acid will dissolve no more. This will leave a thin zinc deposit on the piece. Allow it to dry, then dip it into the molten tin, solder or lead. If a first coat is not satisfactory, dip in the cut acid, dry, and dip into the molten metal again. This method has proved extremely satisfactory. Of course, the proper precautions against accidents should be observed when dipping the articles into the molten metal.—Charles R. Whitehouse, Boston, Mass.

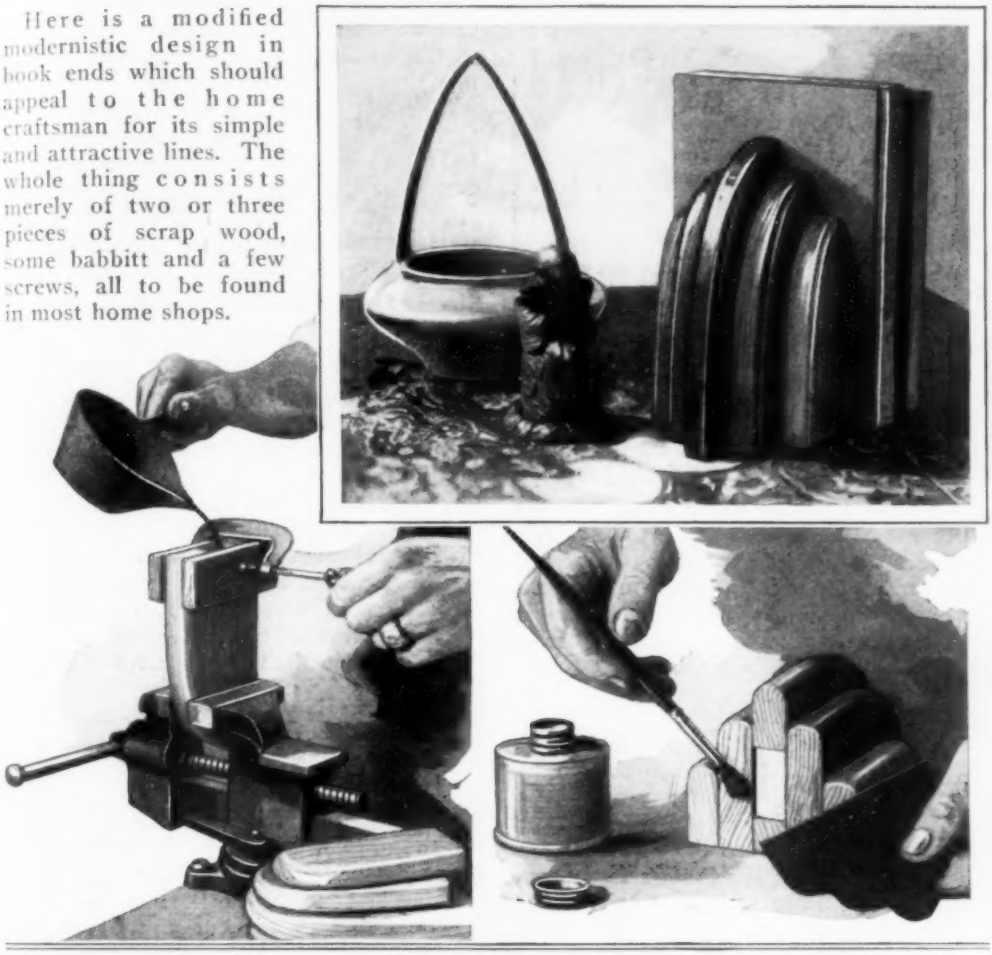
A Help for Night Driving

When making stops or left turns, it is customary to hold one's hand out of the car as a warning to motorists in the rear. An ordinary license bolt with a red-glass head makes an effective signal that is quickly noticed, by mounting it on a ring as shown in the photo.—H. Fowler, Rogers, Ark.

¶When the bag of a vacuum cleaner gets very dirty, put on the hose for blowing, hold the end out of the window and start the vacuum cleaner; this is sure to clean out the inside much better than can be done by shaking the bag.

THESE MODERNISTIC BOOK ENDS ARE EASY TO MAKE

Here is a modified modernistic design in book ends which should appeal to the home craftsman for its simple and attractive lines. The whole thing consists merely of two or three pieces of scrap wood, some babbitt and a few screws, all to be found in most home shops.

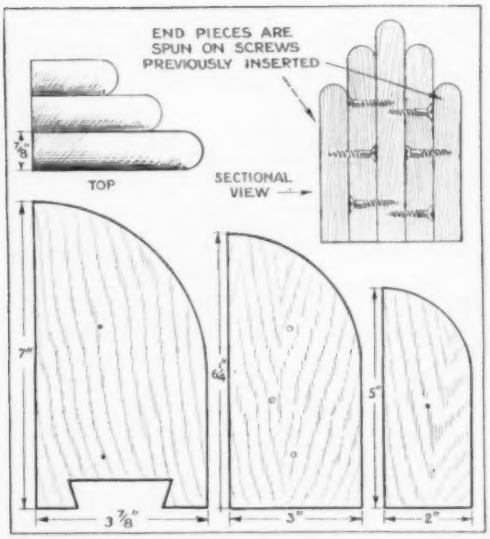


Simple Though They Are to Make, These Modernistic Book Ends Present a Very Attractive Appearance When Finished; Left, Shows the Method of Weighting; Right, the Felt Being Glued in Place

In making these book ends, start by cutting, from ⅞ or ¾-in. lumber, two of the larger pieces shown in the detail and four of each of the others. You will notice that the bottom end of the larger pieces is cut out into a dovetail shape. This cut is to take the babbitt which forms a weight to keep the book end in place. The manner of pouring the metal is shown in one of the photos, two blocks being clamped around the opening and the babbitt poured in. Babbitt hardens very quickly; it will not scorch the edges of the wood in the slightest. The dovetail, of course, prevents the metal from falling out when hard.

The five pieces of wood which form each end must be assembled so that no screws or nails are visible. This can best be done by fastening the two intermediate pieces to the central piece with screws, then spinning on the outer pieces on screws which have previously been inserted from the inside edge of the intermediate blocks, in the manner shown in the sectional drawing.

A strip of black felt, cut to shape and glued to the bottom of each book end, completes the job. Before fastening this in place, however, the ends should be taken apart again for painting. Each block may be painted in a different color,



or in shades of the same color. If the book ends are to be painted in a single shade, it will not be necessary to take the pieces apart for painting; separate colors, however, are almost impossible to apply after the wood pieces are put together.—Ralph T. Moore, Columbus, Ohio.

Waterproofing Shoes

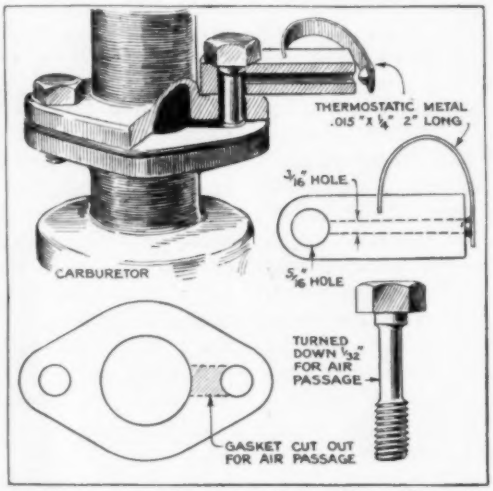
Waterproofing shoes which are to be worn outdoors during the winter is a simple and inexpensive job. About 1 or 2 oz. of beeswax and 8 oz. of petroleum jelly are needed for the job. The department of agriculture recommends that the ingredients be melted together by warming carefully and stirring. The grease should be applied warm but not hot. It is important to get plenty of grease on the edge of the sole and welt, as this is where most shoes leak. The best way to proceed is to set the shoe in a pan and pour in the melted grease. If the shoes have rubber heels, these are left outside.

Green Lawns All Winter in the South

Beautiful green lawns all winter are now common in Florida, and can be had in all of the southern states by seeding Italian rye grass any time during the fall or winter. Specialists of the department of agriculture recommend that this grass be sown on lawns with no preparation whatever except leveling as may be necessary. In the spring, when the regular grass starts growing, the Italian rye will die.

Simple Device Reduces Gas Consumption of Auto

Here is a gas saver that is worth making. It is especially designed for use on model-A Fords, although the idea is applicable to any car or gas engine. Get a piece of flat steel, ¼ by ½ by 1 in. in dimensions. Drill a 5/16-in. hole through one end, as indicated in the detail, and drill a 3/16-in. hole through the piece lengthwise, connecting with the first hole. A piece of thermostatic metal, .015 in. thick, ¼ in. wide and 2 in. long, is then obtained and a ball formed at one end to fit over the 3/16-in. hole snugly. The other end of this piece is driven into a slot cut in the side of the drilled piece, and it is then bent over to a U-shape so that the ball fits the hole at the end as indicated. The shank of a screw, to be used for holding the device in place, is turned down to allow passage of air, and the gasket between the coupling at the carburetor is cut away for the same purpose. When completely assembled, the device will not permit the entrance of air when the motor is cold, but as soon as it heats up, the piece of thermostatic metal draws away from the opening and allows the air to enter, which causes a leaner mixture and thus effects a saving of gas.—A. E. Sanford, Los Angeles, California.


THERMOSTATIC METAL .015 "X ¼" 2" LONG
3/16" HOLE
5/16" HOLE
CARBURETOR
TURNED DOWN 1/32" FOR AIR PASSAGE
GASKET CUT OUT FOR AIR PASSAGE

Thermostatic Gas Saver Acts When Motor Heats Up

SHOP NOTES

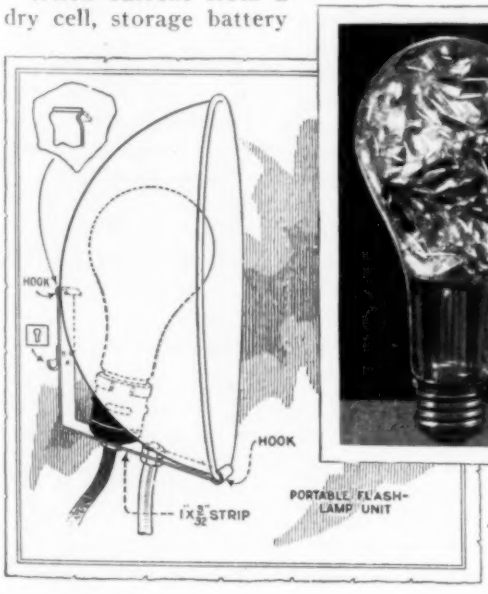
Flashlight Photography Made Easy

By W. E. BURTON

MAKING flashlight photographs without noise, smoke, odor or the danger of fire, and in so short a time that subjects have no chance to move, look scared or close their eyes—this dream of photographers everywhere has been realized in the development of a new lamp that promises to revolutionize flashlight photography. The lamp consists of a standard 100-watt clear-glass lamp base and bulb. Inside the bulb are three things that, together, produce the illumination. They are a short filament coated with a substance that gives off a shower of sparks when heated, a quantity of very thin aluminum foil, which, in a crumpled condition, fills much of the bulb space, and an atmosphere of pure oxygen that is reduced to somewhat below normal pressure.

When current from a dry cell, storage battery or house-lighting system is sent through the lamp, the filament glows, ignites the aluminum foil either directly or through the sparking material, and the foil burns almost instantly, producing an intense light. This action takes place in about one-hundredth of a second, making instantaneous flashlight pictures possible.

After the bulb is used, it is discarded. The slight added cost as compared with other flashlight materials is offset by the fact that the lamp can be used anywhere. To use the lamp, the photographer may make his own holder, at present, and two simple types are shown here. It is absolutely essential, to obtain



Center, the New Flashlamp; Left, a Simple Homemade Holder Designed for Interior Work; if Used without a Stand, It May Be Hung Almost Anywhere by the Hook and Slotted Bracket

The Portable Flashlamp Unit, Made from a Two-Cell Flashlight and Fitted with a Reflector; the Lamp Is Flashed by Means of a Single Cell, as Indicated in the Sectional Drawing

the maximum efficiency, that an aluminum reflector, preferably parabolic, be used.

In photographing interiors, several of the bulbs can be screwed into the sockets of overhead, portable or side-wall fixtures, and set off by operating the room switch. From an aluminum reflector, at least 10 in. in diameter, a quantity of strip brass, a socket and a few odds and ends, a simple and compact portable holder can be constructed. Several of these can be connected in parallel and suspended from a cord or mounted on music stands. An arrangement suggested by engineers who developed the lamp is shown on page 159.

Perhaps the most convenient device, especially where one flash bulb, held in the hand, is to be used, is a modified electric flashlight like the one shown in the photographs and drawings. This was also designed by the lamp engineers.

The handle is a two-cell tubular flashlight case and is equipped with an aluminum reflector. You can use a 25-cent aluminum mixing bowl with almost as good results as a true parabolic reflector.

In constructing the "gun," make a matt surface on the mixing bowl interior by letting a quantity of strong lye solution stand in it for an hour. Then wash thoroughly to remove the black deposit, dry, and then cut, not far from the edge, a hole large enough to receive the flashlight case. The case illustrated happened to be fitted with an extra-large lens, but the small-lens type will do just as well. Fasten the case to the reflector by the most convenient method.

Into the reflector end of the tubular handle, place a standard weatherproof lamp socket. The G. E. 13X-161 Textolite socket is ideal, being of the correct outside diameter. Solder one socket wire to the brass strip that runs from the flashlight switch to the bulb end. Pass the other wire through a wood plug, placed inside the tube just below the socket. This plug is necessary to hold the single battery cell in position. The center contact of the cell rests against a wood or machine screw that is forced into the hole in the wood plug so that it makes contact with the wire. Fasten the socket firmly by means of cement or screws. Place a battery cell in the case, screw the lower cap into place, and you are ready to operate the gun.

By watching the new flashlamp operate, you may believe that the light is insufficient. That is because the foil is consumed so quickly that your eyes do not have time to gauge the quantity accurately. The great speed of the lamp has led to a suggestion that it could be used for making photographs of wild animals, burglars or other objects whose motion is to be arrested.

X-Rays Useful in the Lumber Mill

As a means of examining logs and trees, the X-ray is meeting with considerable success. Its purpose is to detect borers and inner decay, enabling proper precautions to be taken in time to prevent the loss of infected trees. Of even greater value is its use in veneering mills in revealing the nature of the grain. Logs

having a straight grain are not nearly as valuable as those with curly grain. Thus, if the grain in a log can be seen, it is much easier to make a selection and to set prices. Many curly-grained logs command high prices, but before the use of the X-ray for the purpose, the buyer and seller have always had to guess at the probable worth of a log, with the result that a buyer sometimes found himself with a poor log on his hands at the price of a fancy one, or vice versa.—John E. Hyler, Peoria, Ill.

Drawn-Aluminum Filler Rods for Aluminum Welding

The use of cast filler rods for welding aluminum presents numerous difficulties. During the last ten years manufacturers have changed the composition of many castings, so that they are no longer cast aluminum but cast lynite, which does not contain zinc but copper instead, the latter making a tougher and more rugged casting. I have found that it is much better on these castings to use drawn-aluminum filler rods with which a good welding job can be made.—Mart Banke, Detroit, Mich.

Cam Lifter Made from Carriage Bolt

The illustrated tool will be found useful for a variety of purposes, especially for lifting the cams on some types of ignition systems. It is made from an ordinary ¼ or 5/16-in. carriage bolt by cutting off three sides of the head as indicated.—R. Hadley, Fairfield, Conn.

¶When a driveshaft has to be removed from a model-A Ford, the banjo housing should be immersed in hot oil to expand it; then it is an easy matter to force the shaft off.

U-Shaped Hook and a Pinch Bar Are Used to Pull a Wheel Bushing

Effective Puller for Wheel Bushings

A simple but effective puller for a wheel bushing is shown herewith. It consists of a prybar and a U-shaped spring hook, made from ⅜-in. steel rod, the ends of the hook being turned up to form claws. The bar is rested on the edge of the brake drum and the short end is caught in the hook; with the leverage supplied by the long end, moderate pressure on the bar then pulls out the bushing without difficulty.—G. A. Luers, Washington, D. C.

Stamp with Curved Face for Bundles

Irregularities on the surface of bundles make it difficult to get a clear impression with the use of an ordinary flat rubber stamp. By removing the rubber from the stamp, filing the wood down to a curved surface and then replacing the rubber, it will be found that the bundles can be stamped more clearly and without the risk of blotching. The reason for this is that the stamp can then be rolled over irregular surfaces, causing contact at all points.—Kenneth B. Murray, Sturgis, Mich.

Easy Methods of Laying Out Angles

Laying out angles is usually done by means of a protractor. However, the carpenter is quite frequently confronted with the problem of laying off a certain angle on the job. This may be readily done by the use of a 2-ft. rule, or a steel square, following the method described in this article and the dimensions given in the accompanying table. To lay off any angle given in the table by means of a 2-ft. rule, open the rule in the middle until the distance between the inside corners is equal to the distance A given in the table for the particular angle desired. Thus, in Fig. 1, the rule is shown to be open at 6 7/32 in., and the angle formed equals 30°. To lay off an angle by means of a steel square, set the tongue or blade of the square along the line CD. Point C, which is fixed at the 12-in. mark, is the point of intersection of the two sides of the angle. Lay off the distance DE equal to the distance B, given in the table for the corresponding angle, and draw line CE. The angle DCE will be the required angle and will be approximately correct. For an angle of 30° the distance DE should be 6 15/16 in., as shown in Fig. 2. Although a right angle may be readily determined by means of a square, it frequently happens that one is called upon to lay off a square corner when a square is not available. This can be done by using an ordinary rule or even a plain stick without any graduations at all. To do this, first lay off a triangle whose sides are 3, 4 and 5 units or multiples thereof. The right angle is always opposite the longest side. This is shown in Fig. 3. Line FG is laid off 3 units long, either inches, feet, yards, or any other convenient unit. At point F, lay off another line FH, 4 units long, as nearly at right angles as can be determined. Measure across the ends of the two lines and adjust them until the distance GH equals 5 units. The angle GFH is then a right angle. In Fig. 4, the sides of the triangle are 6, 8 and 10 units long, which are multiples of 3, 4 and 5. These dimensions make a larger triangle but its sides are proportional to those shown in

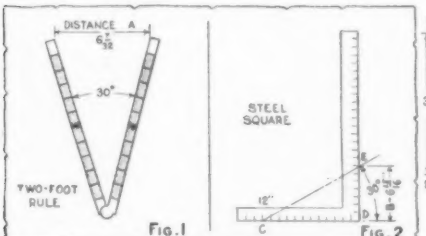


Fig. 1

Fig. 2

BY TWO-FOOT RULE			BY STEEL SQUARE		
ANGLE DEGREES	DISTANCE A	FRACTIONS	ANGLE DEGREES	DISTANCE B	ROOF PITCH
5	1.05	1 3/64	5	1 1/4"	
10	2.09	2 3/32"	10°	2 3/32"	
15	2.13	2 5/32"	15	3 3/32"	
20	4.17	4 11/64"	18° 25'	4"	1/6 PITCH
25	5.19	5 3/16"	20	4 3/8"	
30	6.21	6 7/32"	22 1/2	4 29/32"	
35	7.22	7 7/32"	25	5 11/32"	
40	8.20	8 13/64"	26° 33'	6"	1/4 PITCH
45	9.18	9 3/16"	30	6 15/16"	
50	10.14	10 7/64"	33° 42'	8"	1/3 PITCH
55	11.08	11 1/16"	35	8 13/32"	
60	12.00	12"	40	10 3/16"	
65	12.90	12 29/32"	45	12"	1/2 PITCH
70	13.77	13 25/32"	50	14 5/8"	
75	14.61	14 5/8"	53° 7'	16"	2/3 PITCH
80	15.43	15 7/16"	55	17 1/8"	
85	16.21	16 7/32"	60	20 15/32"	
90	16.97	16 31/32"			

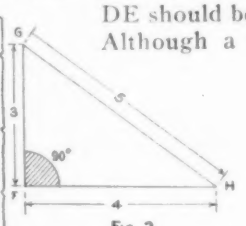


Fig. 3

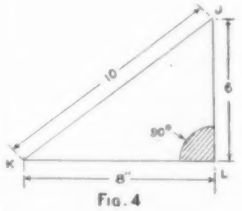


Fig. 4

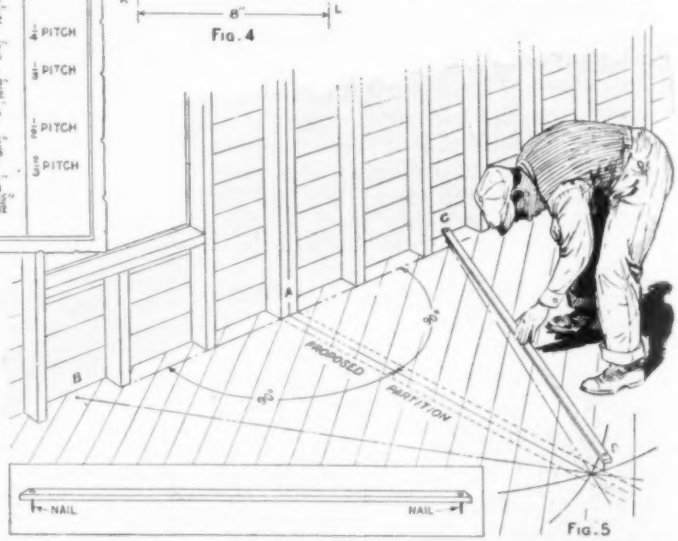


Fig. 5

Here Are Some Easy and Practical Methods of Calculating Angles and Determining Right-Angle Position of Proposed Partitions

Fig. 3. This method, generally known as the "6, 8 and 10" rule, is frequently used in large jobs, such as the laying out of foundations. Another method, which will be found convenient when erecting partitions or similar work, where large angles and dimensions are dealt with, is shown in Fig. 5. In this instance, it is desired to erect a partition at right angles to the wall. On the center line of the plate, from which the partition is to extend, lay off equal distances on both sides of point A, determining the points B and C. Take a stick of any suitable length, preferably a little over half the length of the proposed partition, and measure off distance CD, driving nails at points C and D through the stick and using one for the pivot and the other for a scriber. Fixing the stick at C describe an arc with the scriber end. Repeat this operation from point B to locate point D. Now with a straightedge or chalk line; draw line AD which will be the center of the partition, and will be at right angles to the wall. —L. Perth, Chicago, Ill.

Bench Support for Handling Long Work

When handling long material in the bench vise, an extra support, which is adjustable, will be found highly convenient. The support shown in the illustration consists of a piece of flat iron welded to the end of a length of pipe. Large staples, screwed to the bench leg as indicated, allow vertical movement of the pipe, and one of the staples is drilled and tapped for a thumbscrew, which is used for locking the support at any desired height.—Jos. C. Coyle, Englewood, Colo.

In testing solder, hold it close to the ear and bend it; if it does not give out a cracking sound, it is of an inferior grade.

Floor Brackets for Holding Doors

Weight of Door, When Placed in These Brackets, Causes Them to Grip It Tightly

A pair of hinged floor brackets, made of good hardwood as shown in the drawing, will be found highly convenient by the carpenter whose job it is to set or hang doors. Each bracket is made in two parts, hinged together in the center. The hinged ends are cut out so that the edge of the door can be slipped between them, and when this is done, the weight of the door causes the halves of the bracket to grip it securely.—Chas. H. Willey, Concord, N. H.

Cleaning Steel and Other Hard Metals

Steel that has become rusty and dirty can be cleaned in the following way: Mix together water, 1 gal., caustic potash, 3 oz., trisodium phosphate, 3 oz., and sodium cyanide, ½ oz. After stirring well, heat the solution to a temperature of approximately 200° F. Immerse the articles to be cleaned in the bath, holding them with a piece of wire so that the hands will not get in the solution. After immersion, dip the piece in clean hot water and then in clean cold water. Then dry it off in sawdust if available. An article washed in this way will be as clean as when new.—Charles R. Whitehouse, Boston, Mass.

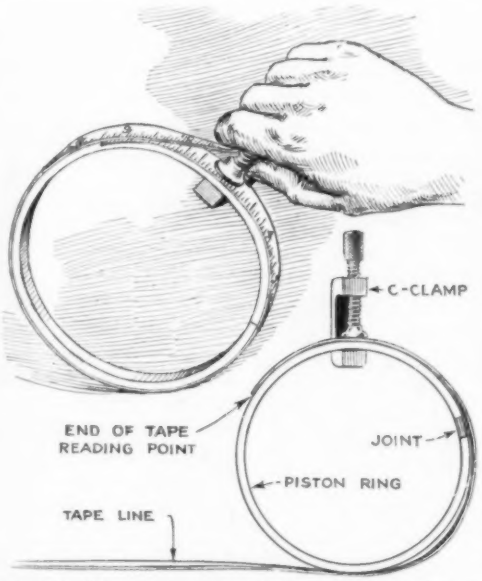
Claw Clamps on Counter Hold End of Wire Screen While It Is Being Measured

Claw Clamps on Counter Help in Measuring Screen

Wire screen, which has a tendency to roll up when laid on a counter, can be held down at one end by means of a pair of claw clamps. Two 8-in. lengths of heavy-gauge wire are bent to the shape shown in the detail, one end being filed to a sharp point and the other drilled to receive a small cotter pin. Holes are drilled through the workbench or counter to receive the lower end of the clamps, which are pushed through from the top, after which a coil spring and washer are slipped over the end, and the pin inserted. The spring keeps the point of the clamp tightly against the top of the bench. In use, one end of the wire screen is slipped under the two clamps so it can be unrolled as far as desired and cut off. If several lengths of the same size are needed, a suitable weight is kept at the loose end to prevent it from rolling back, while the starting end remains held under the clamps.—G. E. Hendrickson, Argyle, Wisconsin.

Quick and Accurate Method of Fitting Piston Rings

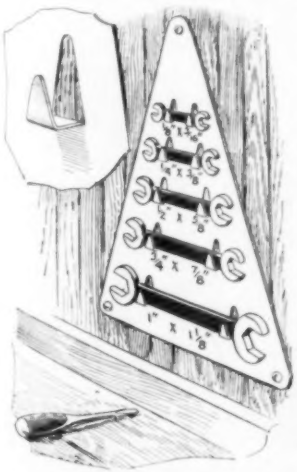
When refitting a motor with piston rings, the usual practice is to fit each ring individually, filing off a little at a time, until the ring enters the cylinder with a sufficient gap to take care of the expansion. A better method is to gauge each cylinder bore with an inside micrometer, and mark the size on your paper pad in inches and decimals. Examination of a worn cylinder will disclose the fact that when new rings are needed they should be made to fit the worn part of the bore, and advantage must be taken of the expansion factor in order to make the ring just so large as to barely pass through the worn parts of the bore, that is, without leaving too large a gap. The rule for the expansion allowance is .00075 in. for each inch in diameter of the ring. When anything is measured on the circumference with a tape line, the possible error of measurement is reduced to practically one-third, and when the bore has been accurately measured, it becomes easy to figure out the exact circumference of the ring, while making allowance for expansion, etc. As the readings on the circumference are taken with a tape line, with the graduations on the outside, allowance must be made for the thickness of the tape line, and this allowance must be three times the thickness of the tape. When a cylinder is worn in excess of the expansion factor, and the ring must pass through an unworn part, either at the top or lower part of the cylinder, the ex-



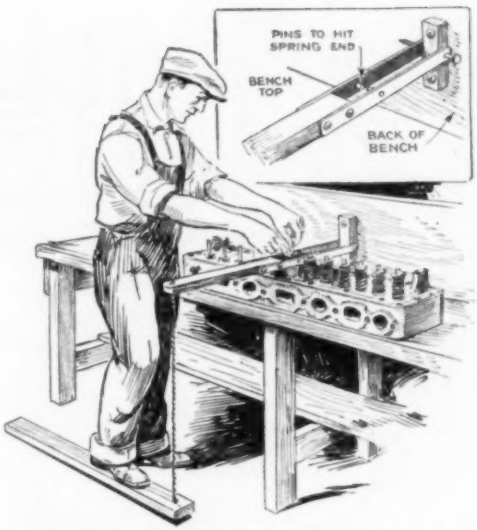
Careful Measurements Are Necessary in Order to Make Piston Rings Fit Accurately

pansion factor is ignored. The method of using the tape line for measuring the circumference is as follows: Take a line, preferably one broken off at an even inch, and clamp it to the ring as shown in the drawing, placing the clamp a short distance from the gap, and about 2 in. from the end of the tape line. Allow the end to overlap the side of the ring slightly, draw the tape around the ring and bring the ends of the ring together by drawing the tape up tightly. The circumference can now be easily read and the exact amount of the ring's oversize determined. The excess amount is filed off from one ear of the lap joint, a feeler being used to measure the reduction, after which the remaining ear is filed down until the two meet in a light, tight fit. Upon trying the ring, it will be found to be a perfect fit, and the other rings are then filed to the same dimensions, providing all the bores are alike in size. If not, allowance is made for the difference. The formula for the circumference measurement of the ring is as follows: Circumference is equal to the diameter of the cylinder times 3.1416, plus three times the thickness of the tape line and, in the case of an unworn cylinder, the expansion factor of .00075 in. for each inch of the ring's diameter.

Wall Plate for Holding Wrenches



For holding open-end wrenches, the illustrated wall plate will be found convenient and, in addition, neat in appearance. Take a piece of sheet metal, cut it to a triangular shape and drill a hole at each corner so it can be screwed to the wall. After laying off the exact position the wrenches are to occupy, sections of the metal are punched out with a cold chisel, and bent outward to form holders.—Charles H. Willey, West Concord, N. H.



Compressor for Valve Springs of the Overhead Type Is Operated by Foot

Spring Compressor for Overhead Valves

Removing the overhead valve spring on a motor, when it is necessary to grind valves, is often a rather difficult task. However, a device similar to the one shown in the illustration, can easily be made in the home garage, and will simplify the work considerably. Fasten a block to the back of the bench or wall as shown in the detail, or use one of the garage studs. Two pieces of ⅛ by 1-in. flat iron, about 18 in. long, are fastened to a piece of wood, and two pins are provided in these lengths of strap iron to fit over the valve springs. The extending ends are pivoted to the block on the wall, forming a lever which can be moved up and down. To compress a valve spring, the pins are slipped over the valve stem and directly against the edge of the spring. Then pressure on the lever holds the spring down and allows the retaining pin to be removed. It will be found handy to attach a length of rope to the end of the lever so that a tread can be used to hold the lever down, while both hands are free to extract or insert the pin.

¶To detect a crack in a casting, apply oil to the suspected surface, wipe off and paint with alcohol and whiting mixed in equal parts; the alcohol evaporates and cracks are indicated by the oil marks on the whiting.

Bent Iron for

by Robert Gregg

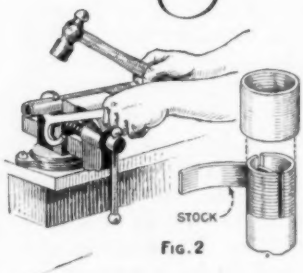


FIG. 2

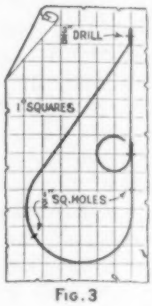


FIG. 3

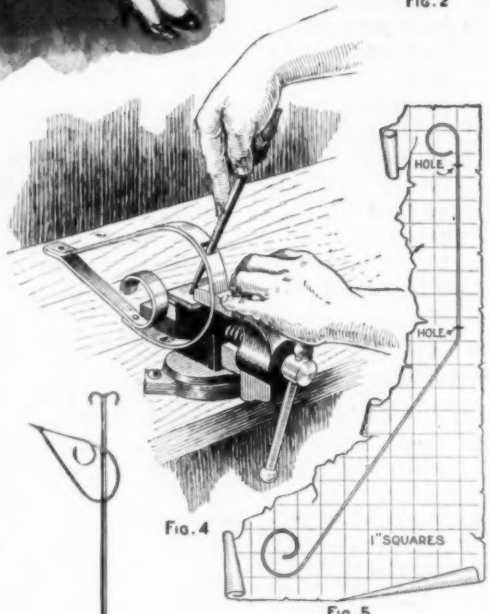


FIG. 4

FIG. 5

THE HOME craftsman who is a little tired of the sharp angles and straight lines of the modernistic period, and a trifle "stale" on constant woodworking, will find much that is appealing in bent-iron work. Working with ordinary tools and with cold iron, the average workman will find that attractive all-metal pieces for the home or garden can be fashioned both easily and cheaply.

Bent iron should be particularly popular with the home worker in view of the fact that all of the materials used can be procured in almost any locality. Strap iron in graduated sizes is usually carried in stock by all good hardware stores. The various other pieces of square and round stock are generally available at the same place, as are also the rivets and bolts used in assembling the different pieces.

As in every other craft, it is advisable to start with something comparatively easy, the bridge lamp shown in Fig. 1, for example. The stem of this is a 50-in. length of ½-in. square iron, with 2 in. of one end split in half with a hacksaw and hammered into a circular shape around a piece of pipe, as at the left in Fig. 2. The lamp arm is fashioned from ⅛ by ¾-in. strap iron, bent to the shape shown in Fig. 3 and fastened with a single rivet at the point indicated. A simple bending tool is a long pipe nip-

the Home Craftsman

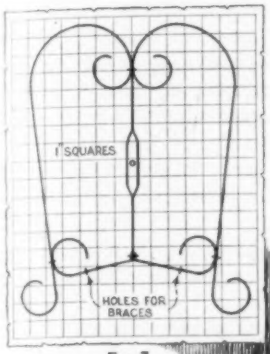


FIG. 7

FIG. 8

With a Little Care and Ingenuity, the Home Craftsman Can Make Many Worth-While Things in Iron; the Pieces Shown in This Article, While Simple Enough for the Beginner, Will Teach All That Need Be Known for the Making of More Ambitious Projects

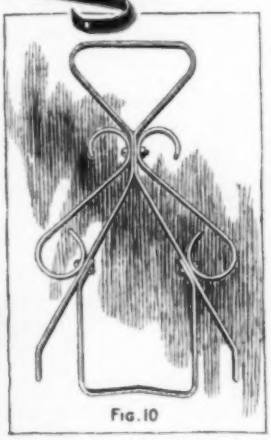
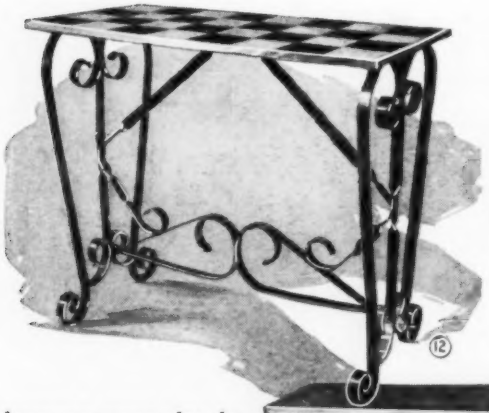


FIG. 10

ple, Fig. 2, slotted down to about twice the width of the iron being bent and fitted with a coupling or cap screwed on the end to prevent it from spreading under the pressure of the stock when bending. The end of the stock is simply slipped into the slot, and the iron bent by taking small "bites," although bends of small radius can be made by pulling the iron around the pipe. Various sizes of nipples may be used.

Both ends of the piece should be neatly rounded with a file in order to harmonize with the round edges of the strap-iron stock and the general sweeping lines of the lamp. The actual bending is done by hand, with the exception of the two curved parts of the split upper end, which must be hammered. A few light blows with the



hammer may also be necessary in obtaining a nice inside curve on the piece. If hammered at all—and this applies to all work—the blows must be light, and the piece should be well backed against some round surface, such as a short piece of pipe. Graceful curves are an impossibility otherwise.

A ½-in. hole is drilled through the piece at the points indicated, and these holes are worked square with a file in the manner shown in Fig. 4, care being taken that the file is at all times pointed toward the opposite hole in order that the cuts may be beveled properly. The holes must not be made too large—a fit which will permit the sliding of the piece along the stem but not so loose that it will refuse to stay in place, is required.

The legs for the lamp, four in number, are fashioned from ⅛ by ¾-in. flat stock, shaped as shown in Fig. 5. Constant checking is required in order that the four legs may be exactly alike. Wood molds can often be used to good advantage. The strips may be placed side by side and curved in one operation by means of two strips of wood clamped on either side of the metal pieces. The legs are fastened to the lower end of the stem with small bolts, as in Fig. 6. Rivets can be used if desired, but these are more difficult to work and do not improve the appearance of the fastening to any great extent.

Finishing the lamp is merely a matter of paint, together with a standard light socket, which is screwed into a hole drilled through the end of the light arm. The cord hangs free, as is usual with lamps of this variety.

The magazine rack, which completes the group shown in Fig. 1, offers something a trifle more advanced, but by no means difficult. Each end is composed of five pieces of ⅛ by ½-in. strap iron, curved to shape and assembled according to Fig. 7. All free ends should be neatly rounded. The twist in the center stem of each end is turned to shape with a heavy wrench, as shown in Fig. 8. The two ends are held together with four 9-in. crosspieces, two of these being spanned across the outside and two across the bottom, as pictured in Fig. 9. Both sidepieces are from straight stock, while the bottom crosspieces are given a full twist at either end. All preliminary assembling should be done with bolts, as it is usually necessary to remove the pieces for drilling, proper shaping, etc. Not until the

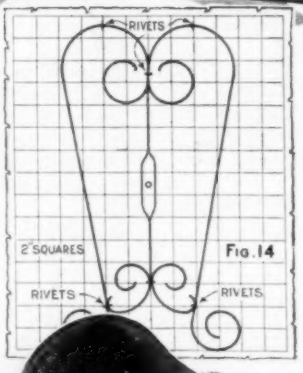
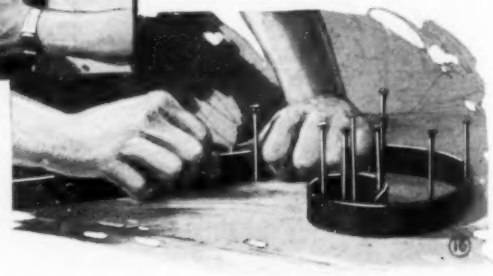


Fig. 14



whole thing is adjusted properly should the final riveting be done. The handle for the rack, 15¾ in. high, is shaped and fastened according to Fig. 10, and then fastened to the center of the stand as in Fig. 12.

When the final bolt has been turned in, the pieces should be checked for balance, both individually and as a whole; then the bolts may be removed, one by one, to allow of the substitution of small rivets. If desired, the original assembling bolts may be left in place. If such a procedure is followed, the ends of the bolts should be snipped off close to the nut and lightly tapped with a ball-peen hammer. Fig. 11 shows the finished job done in black japan splashed with cream paint.

After constructing the magazine rack, it will be a simple matter to fashion the really charming table and bench shown in the headpiece and Figs. 12 and 13. Both of these are made from 3/16 by 1-in. strap iron throughout ,and assembled in much the same manner as the rack just described. Fig. 14 gives the shapes and manner of assembling the curved pieces which go to make each end of the table. Hammering must be resorted to in bending this heavier stock, especially on the short pieces. These should be shaped around a length of iron pipe, about 2 in. in diameter, as shown in Fig. 15. The long pieces may be bent by hand around a wood mold, or, around a pegging of heavy spikes, as shown in Fig. 16. The spikes must be driven fairly close together on short curves, as otherwise slight angularities are bound to occur.

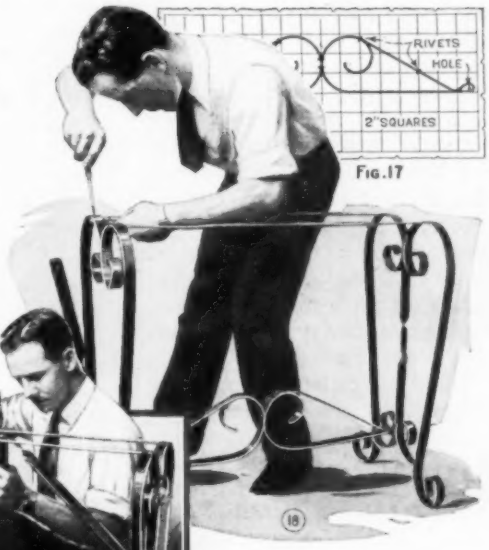
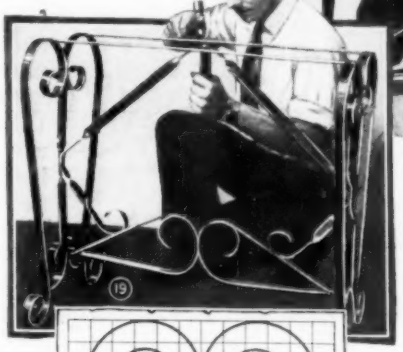


Fig. 17



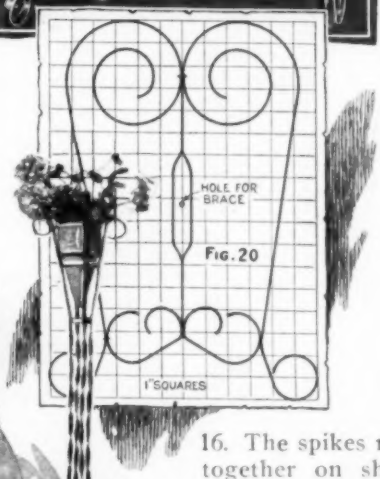


Fig. 20

The four curved portions which make each end, together with the straight center stem, are fastened together temporarily with bolts, and it is apparent that the lower crossbrace must be ready for assembling at the same time. This is made in two pieces, each 15¾ in. long and 5⅞ in. high over all, as shown in Fig. 17. The table is braced at the top with two straight lengths of slightly heavier stock, as in Fig. 18. These straps are fastened to the

underside of the curved end-pieces and then bent up slightly to come flush with the top of the table.

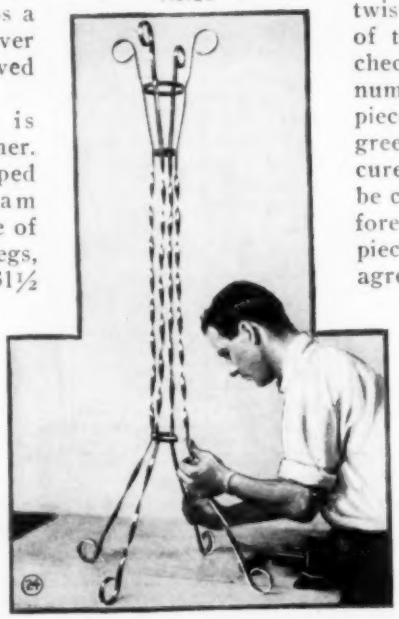
A final brace, fastening to a short crossbar between the top braces and joining onto the ends and lower cross-pieces, completes the iron work on the table, as pictured in Fig. 19. The single twists in this piece are put in with a heavy wrench as previously described.

After careful checking, the various pieces may be riveted together. The top, shown in Fig. 12, consists of a shallow galvanized-iron pan in which are set thirty-two 4-in. tile blocks in orange and cream, surrounded with a ½-in. white border. The iron work should be painted a solid black or dark gray, with perhaps a contrasting touch of silver applied to the short curved pieces in each end.

The bench to match is made in a similar manner. Each end should be shaped according to the diagram shown in Fig. 20. Because of the longer span between legs, 45½ in. as compared to 31½ in., the cross spans and diagonal truss should be made from slightly heavier iron. Notice, too, that a different-shaped diagonal is used on this piece, Fig. 13. If the two pieces are to make a matched set, the painting should be the same, and the top would be in tile as before. Fig. 13 shows the piece finished with a stained and varnished hardwood top, which may be more to the liking of many amateur craftsmen.

The flower-vase holder shown in Fig. 21 is a fairly simple project, being merely a matter of four twisted legs, three rings, and two crossbraces. The most difficult portion of this stand is the twisted legs.

FIG. 23



It is quite possible to twist the ⅛ by ½-in. stock with a wrench, as shown in Fig. 22, but such a method usually throws the piece off to one side or the other. More accurate results can be obtained by gripping one end of the metal in a lathe chuck, and fastening the other end to the lathe tailstock, running the lathe at a slow speed or pulling it around by hand. Lacking the lathe, good results can be obtained by using the weighted arrangement shown in Fig. 23. The weight must be of a size in keeping with the stock being twisted. Using such a method, it is usually possible to get a length of twists which will need no straightening out as is usually the case in vise-twisted pieces. Regardless of the method used, careful check must be kept on the number of twists given each piece in order that some degree of balance may be secured. All four legs should be cut to the same length before starting work on the piece, and later shaped to agree with the general arrangement in the photographs.

With the legs twisted to the proper shape, it is a simple matter to drill the pieces and insert the rings, as shown in Fig. 24. The joints may be lapped at the ends, and the bolt or rivet inserted through the overlapping sections, or the ends may be brazed together to form a solid ring. The size is immaterial. Before starting, it is advisable to purchase the vase to be used, and then make the pieces to fit. The stand shown in the photographs is 54 in. high, but lower stands are sometimes more desirable, especially if used indoors. For outdoor use, the piece may be made

as tall as may seem fit, although anything larger than the one shown in the pictures would demand heavier iron stock. The two short braces seen in Fig. 21 can be twisted by using a vise and wrench, or with a heavy breast drill. As with the other pieces, the first assembling should be done with bolts, removing these later for the final assembly with rivets after the piece has been trued up and found satisfactory.

Tradition demands that all bent-iron work be finished black. However, many excellent effects can be obtained through a judicious use of color. Solid tones of green and red lend color to the pieces when backed against a sunroom or garden setting. A marbled effect, which is quite pleasing, can be produced by lightly daubing the piece with cream paint over the initial coating of black. This method was used on the bridge lamp and magazine rack shown in the headpiece. Two colors may often be used, as pictured in the table design, the short curves at the bottom of each end being silvered to contrast with the black which was used solid on the rest of the piece.

It is needless to say that the color combinations are almost endless. An excellent finish for iron work to be used outdoors consists of thin coatings of linseed-oil varnish burned off over a charcoal fire. The varnish will first go up in smoke with a strong formation of soot, and finally burn up entirely. The process is repeated three or four times, that is, after one coating of varnish is burned off a new one is applied, until the iron assumes a uniformly deep-black color. The process is completed by rubbing the iron with a rag well saturated with varnish. The black turns completely dull, and forms an excellent protective covering.

"Choker" for Dragging Logs

My boys and I have a job in the woods cutting lath bolts and pulpwood. The sticks are cut to 8-ft. lengths, vary from 4 to 12 in. in diameter, and it is necessary to bunch them up in piles along the road. Some of the larger sticks are quite heavy and, as we had no lug hooks, customarily used for the purpose of moving them, I made a "choker" that filled the bill. I got a hardwood sapling, about 3 in. in diameter and 4 ft. long, bored two holes 1 in. apart in the middle, and twisted two

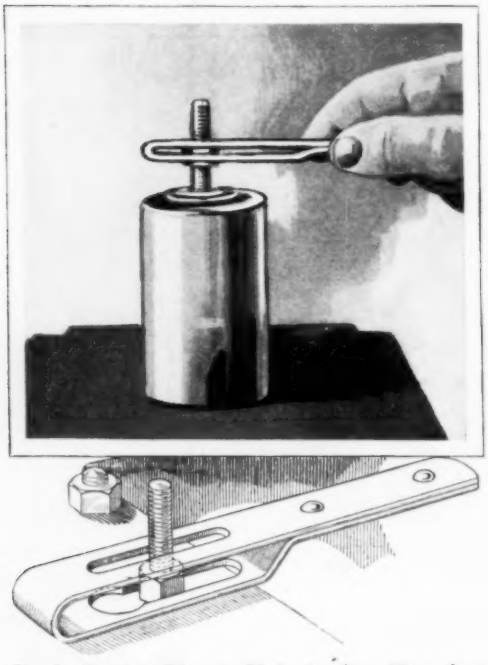
This "Choker," Which Takes the Place of Lug Hooks, Makes It Easy to Drag Logs

strands of telephone wire together long enough to make a 12-in. loop. Both ends of the wire were slipped through the holes, bent down about 2 in. and stapled. Giving the lug stick half a turn will cross the wire so that it holds the log securely. —J. J. Brindos, Big Falls, Minn.

Flame Deflector for the Blowtorch

In order to properly heat the gluepot or to melt metals in crucibles, it is often necessary to direct the flame of a blowtorch vertically. The stand shown in the photo will serve as a flame deflector for this purpose. A 1-in. iron elbow is drilled and tapped for the threaded end of a ⅜-in. steel standard, and the other end of the standard is threaded into the iron base. The torch is set on the base with the nozzle nearly touching the elbow.—W. C. Wilhite, Hornsby, Illinois.

One-Piece Ratchet Wrench



Simple Ratchet Wrench Made in One Piece from Length of Flat Iron

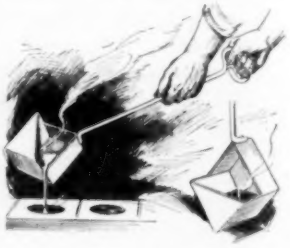
Driving a well-fitting nut a considerable distance on a screw that is in a position where a wrench cannot be turned all the way around, can be easily done by means of a ratchet wrench. A cheap wrench of this type is shown in the illustration, and can be made by any shop hand. It is simply a piece of flat metal with two slots cut in it, one of which clears the screw while the other fits the flats of the nut. The latter slot ends in a hole large enough to clear the nut. Then the strip is bent double, as shown, and the ends are riveted together to form a handle. In use, the top of the wrench rests on the nut and the latter is turned with a back-and-forth action, to engage or clear the nut.

Lubricating Ford Steering Gear

On model-A Fords, the roller thrust bearings on the steering spindles often collect grit and do not turn freely under load. The sector shaft becomes dry, and the small bearing at the top end of the steering column drags. Place a jack under the front axle to take the load off the wheels. The lightest oil that can be handled by the pressure gun at hand is forced into the grease fitting on the upper end of the spindles. The steering wheel is turned back and forth, and the dirty oil that comes out of the joints about the thrust bearing is wiped off. As soon as the oil issues clear, apply a little light grease with the gun. The sector shaft is freed by forcing grease from the worm-gear case, or spraying penetrating oil in the back of the sector arm on the outside of the frame. As the Gemmer steering gear on the later cars have no Zerk connection on the sector-shaft bearing, a ¼-in. nipple is turned into the filling hole on the wormgear case. The pressure should be applied gradually, and the steering wheel turned often to assist the grease in working along the shaft. The bearing in the steering column just under the wheel can be oiled with light oil applied a drop at a time, and then the wheel is turned to spread it.—E. T. Gunderson, Jr., Humboldt, Iowa.

Ladle for Carrying Molten Babbitt from Distant Point

It often happens that a bearing has to be babbitted a considerable distance from the place where the babbitt is melted. This necessitates carrying the ladle at arms length, using both hands, and besides, one must keep both eyes on the ladle in order not to spill the metal. By the time the bearing is reached, the babbitt may have cooled off too much for pouring. For such jobs, the special ladle shown in the drawing will be found useful. It is cut out of a square can and a cover is brazed to the top of the uncut half. A handle is made from a length of steel rod and brazed to the container. This can is not used for melting the babbitt but to carry it to the place where it is needed. When filling the ladle and when pouring the metal, it is held as shown at the left, but between melting pot and work it is carried upright in one hand, with the metal as shown at the right.—Harry Moore, Hamilton, Can.

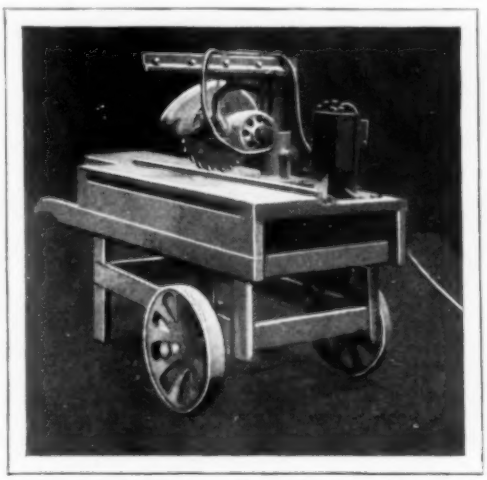


Reducing Pulley Wear from Abrasive Dust on Belts

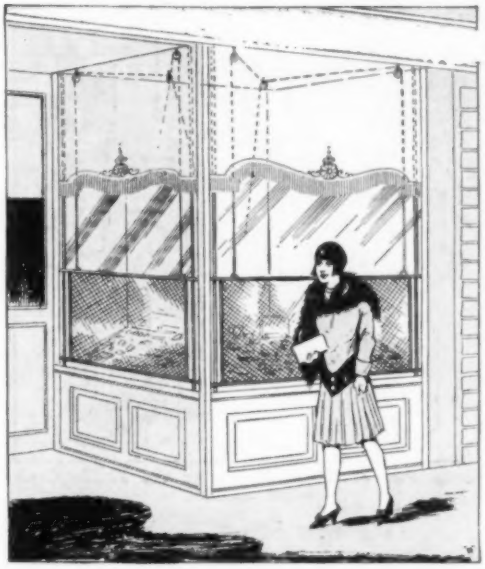
Belts running in a place where the air is full of abrasive dust often wear away the surface of the pulleys, particularly at the crown. Although it is general practice to run belts with the slack side on top, it is often best to drive with the tight side on top, which increases the life and efficiency of the belt and pulleys. Where there is an extreme amount of abrasive dust flying around, and the slack side of the belt is at the bottom, the belt flap, or vibration, which always occurs on this side, will tend to shake the dust off the belt and thus prevent it from being carried around the pulleys and causing wear when the belt slips. When the tight side of a swiftly moving belt is at the bottom it presents a good place for dust to gather. In such cases the advantage gained by having the slack side on top is easily offset by the longer belt and pulley life and the increased efficiency by running the belt with the slack side on the bottom.

Portable Power Saw for the Shop

In plants and on construction jobs where it is more convenient to move the bench saw to the work than to bring the work to the saw, the arrangement shown in the photo will prove a time and money saver. The bench saw usually comes mounted on a wooden stand. This is in turn placed on a frame of 2 by 4-in. stock, with two of the longitudinal members at the top projecting 2 ft. to serve as handles. One end is mounted on iron wheels, and the other on legs, also of 2 by 4-in. stock, making the bench level. The outfit is trundled like a wheelbarrow. A 100-ft. length of heavy, insulated cable, and a few power connections are provided so that the saw can be used anywhere.



Power Saw Mounted on Wheeled Truck So That It Can Be Readily Moved About

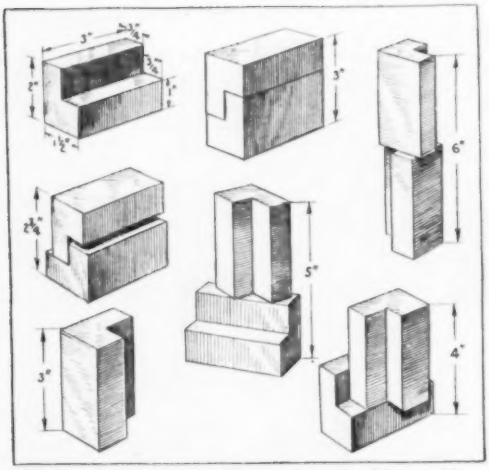


Guards Inside of Store Window Can Be Drawn Up Out of Sight during the Day

Improved Window Protection

Window guards that slide vertically on inside tracks, as indicated, are easily lowered at night, while, during the day, they are hoisted out of the way and hidden by the drapery across the upper part of the window. The horizontal rails are drilled at each end to fit vertical rods which are rigidly fastened along the sides of the window. In this way the guard can be slid up or down without hitting the window. Light, strong ropes are tied to the upper rail of each guard and are brought over pulleys driven into the ceiling, all of them connected to one length of rope, which is readily accessible from the inside of the store. —Dan Courtney, Chicago, Ill.

¶Paraffin rubbed on a grinding wheel while in motion will permit aluminum to be ground without clogging the wheel.



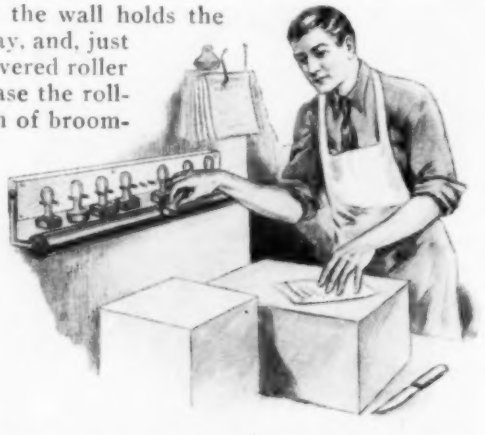
Handy Pair of Setup Blocks for the Planer Gives Eight Heights

Planer Setup Blocks

Machined from mild steel according to the dimensions shown in the illustration, a pair of setup blocks for the planer, will be found to give 8 heights when arranged in the various positions indicated. Any machinist who has much planer work to do will greatly appreciate a couple of these blocks and the time saved by their use will more than justify the time spent in making them.—Chas. H. Willey, Concord, New Hampshire.

Inked Roller Speeds Up Stamping

Inking of rubber stamps in the shipping room of a small factory was accomplished quickly by the roller shown in the drawing. A long rack on the wall holds the stamps in the usual way, and, just below it, a long felt-covered roller is mounted. In this case the roller was merely a length of broomstick and the piece of felt was sewed end to end. With the roller properly saturated with ink, it is the work of but a second to select any stamp from the rack and ink it while it is being taken down.—G. E. Hendrickson, Argyle, Wisconsin.



Inked Roller under Stamp Holder Saves Time in the Shipping Room

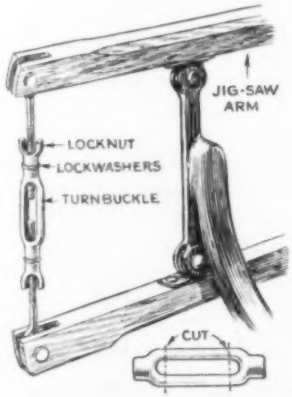
The Manipulation of Gold Leaf

In gilding on glass, it is necessary to size the surface with water size, flowing plenty on until it runs off in quite a stream; onto this the expert swings his leaf, and it lands somewhere on the outlines of the lettering—he is not particular just how accurately, so that the letter is covered; and when he has all the letter spaces covered, with perhaps a great deal of space not included with the letters, he permits it to become dry. The leaf settles down flat on the glass. There are several brands of gold leaf, grading according to amount of pure gold contained and the intended use. One variety is made expressly for gilding on glass, another for gilding on wood. The difference is mainly in the degree of thinness. One layer of leaf makes a good job on wood, while on glass two layers make a better job than one. For exterior gilding the medium shade of gold leaf does best; the pale-colored leaf contains silver, hence tarnishes from gas or smoke. Water gilding is that in which the leaf is laid on a size composed of isinglass, or glue and water; oil gilding is done on a size composed of oxidized linseed oil. Water size is for gilding on glass, and oil size for gilding on wood. Oil size may also be used on certain textiles, and other surfaces, just as water sizes are sometimes used in decorative work. Water-size gilding is burnished as soon as the size and leaf are dry, by rubbing with a wad of raw cotton; the same with oil-size gilding. One book of gold leaf will gild 1½ sq. ft. of surface. Varnish impairs the luster and color of gold leaf. If varnish must be applied, first coat it with pale shellac. Gold leaf is injured by dampness and cold. If gilded work is varnished before it is perfectly dry it will show scratches. To avoid this, apply a thin coat of white shellac, which will soon dry, and

upon this the coat of varnish may be laid. To remove gold leaf from any part where not desired, as in letter gilding or lining, use a dampened chamois skin. In oil-size gilding, if the size is too fresh it will drown the gilding or injure its luster. Better have the size too dry than too wet. If too dry, breathe upon it, which will give sufficient "tack" to the size to hold the leaf. Where two pieces of leaf overlap they will often cause a joint to show and this may be removed by gently stippling it with the tips of a bristle brush. To prevent laps showing on very smooth surfaces, have the size quite tacky. When gilding becomes dull from gases and smoke, its color may be restored by a weak solution of sulphuric acid. To prevent gold leaf from adhering where not wanted, as when letters of gold are to be made on a painted, or other, surface, a raw potato, cut in two and rubbed over the parts that are to resist the leaf, may be employed.

Locknuts on Power-Jigsaw Turnbuckles Keep Tension of Saw Arms

When small jigsaws are run by motor, it is often found that the turnbuckle, used for holding the tension of the saw arms, tends to loosen because of vibration. A locknut on either end of the turnbuckle will remedy this trouble. One end of the turnbuckle is made for a right-hand thread and the other for a left-hand thread, and as it is usually impossible to get a left-hand nut from the hardware dealer the following method can be resorted to: Get an extra turnbuckle of the proper size and cut off the ends. The resulting improvised wingnuts are driven against either end of the regular turnbuckle and a small lock washer is provided between them.—Lester P. Young, Culver, Ind.



Quick-Acting Barrel Sling

Pointed Brackets, Pivoting on Ring, Make a Quick and Efficient Barrel Hoist

Handling barrels quickly and easily is the feature of the sling shown in the illustration. It consists of a ring on which two brackets are pivoted. Each bracket is made of a piece of ⅜ or ½-in. flat iron, forged to the shape indicated in the detail and slipped over the ring while they are hot, after which they are bent over still farther so that they will not come off again. Steel points are provided on the flat surface of the bracket which makes contact with the barrel side. These points are threaded at one end and are driven into tapped holes drilled in the bracket. The ring should be slightly larger than the largest diameter of the barrel. A hole, drilled in the end of each bracket, permits the attachment of a rope. In use, the ring is lowered over the barrel, and when the rope is pulled upward, the brackets lock against the side of the barrel. As a precaution against slipping, the ring and hooks should be engaged just below the center part of the barrel.

¶Cover the exposed parts of a damp clay runner with oil, preferably kerosene, before pouring in melted babbitt.

A Handy Feature on These Scales Is the Detachable Blackboard

Removable Blackboard on Scales

A Wisconsin produce buyer, who does much of the weighing of poultry, hides, etc., in a cold storehouse, uses a detachable blackboard and scale-sheet holder as shown in the drawing. All figuring at the time of weighing is done on the blackboard and, when the check is to be made out, the board is easily removed from the sockets provided in the top of the scale and taken to the office where it can be used for reference. As an additional convenience, the blackboard allows the figuring to be made large and readable, even though the operator may be wearing gloves at the time.—G. E. Hendrickson, Argyle, Wis.

Substitute for Litmus Paper

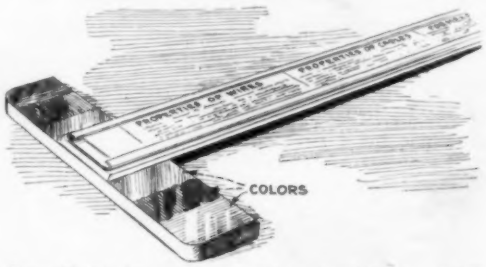
A chemical indicator to take the place of litmus paper can be made from the juice of elderberries. About two handfuls of the berries are pulped by squeezing between the hands and the juice collected in a cup. The juice should be screened through a cloth to remove solid particles and wax. The next step is to cut up strips of white blotting paper or white rags into rectangles, about ¼ in. wide and 3 in. long. These are dipped in the clear red elderberry juice and dried. In order to determine whether a liquid is acid or alkaline, add a drop of the berry juice to the liquid and insert one of the prepared strips. Like litmus paper, it will remain red in acids and turn blue in weak alkalis. One can test this out with washing soap and vinegar.—Alan Osbourne, Boston, Mass.

Corrugated Bottom for Hardware Drawer

By placing a piece of corrugated sheet iron in the bottom of a shallow bench drawer, it becomes an easy matter to pick up small hardware with the fingers. This material is also useful to make holders for drills and reamers, using the sheet iron in inclined racks at the back of the workbench.—C. H. Willey, Concord, N. H.

Draftsman's Data on T-Square

Draftsmen who like to have their calculating data as handy as possible will appreciate the method shown in the drawing. A length of light sheet metal a little wider than the T-square, is drilled with small holes and attached with screws to the back of the square. Before doing this, however, the edges are bent over so that a strip of celluloid can be slipped between them and will be kept in place. Tables,



Sheet-Metal for T-Square Holds Draftsman's Data, Covered with Celluloid Strip

formulas and other data can then be slipped under the celluloid, where they will be kept clean.—H. Henricksen, Hoboken, N. J.

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